TERM FIRST

CLASS 9TH TUTORIAL

THE LEGENDS

SCHOOL OF EDUCATION

KANITAR, SADRABAL, SRINAGAR

Topic: The Adventures Of Toto

Q#1 How did Toto come to grandfather's private zoo?

Ans. Toto came to be a member of the grandfather's private zoo after he had bought Toto from a tonga driver for the sum of five rupees. Actually, the author's grandfather did not like the place assigned to Toto by the tonga driver. So, in order to give this little creature his deserving place, he added him to his personal zoo.

Q#2 "Toto was a pretty monkey." In what sense is Toto pretty?

Ans. Toto was a pretty and attractive red monkey. Toto had bright eyes sparkling with mischief,pearly white teeth, quick and wicked fingers and a gracious tail which served as a third hand. The smile of Toto was cute .altogether these qualities made him pretty.

Q#3 Why does Grandfather take Toto to Saharanpur and how?

Ans. The author and his grandfather keep Toto in a closet in the author's room. But Toto caused destruction of the ornamental paper and blazer. Then Toto is transferred to the servant's quarter which is a residence of other animals. But, there also Toto didn't allow any of his comrades to sleep. So, grandfather doesn't find any alternative than to take Toto along with him to Saharanpur.

Grandfather took Toto in a big black canvas kit bag with some straw at the bottom.

Q#4 Whydoes the ticket collector insist on calling Toto – a dog?

Ans. At first the ticket collector may have felt him to be a dog in a rush and asked Grandfather to pay his fare. But on experiencing the argument made by Grandfather regarding tortoise, we come to a conclusion that the ticket collector had deliberately put him in the category of dogs believing that monkeys should be charged with fare as the dogs are

Q#5 How does Toto take a bath? Where has he learnt to do this?

Ans. Toto's way of taking a bath seems to resemble to those of kids. When he is provided with warm water, he cleverly examines the temperature and then slowly steps into the bowl having water. Then he takes soap and rubs it all over himself. When the water cools down, he gets out quickly and rushes to the kitchen fire to warm himself.

He has learnt this method of bathing from Ruskin bond, the author.

Q#6 How does he almost boil himself alive?

Ans. One day, Toto removes the lid of the kitchen kettle left on the fire to boil. Finding the water just warm enough for a bath, he gets in. Initially he feels comfortable but when water starts boiling, he raises himself. But on finding it cold outside, sits down again. He continues to hop up and down until grandmother arrives and pulls him half boiled out of the kettle.

Q#7 Which activity of Toto annoyed grandmother?

Ans. One day, Toto was stuffing himself with rice. Grandmother screamed on seeing him and he threw things at the family members. Then he escaped through the window with the dish of pullao and sat on a tree. After finishing the dish, he threw the container on the ground which broke into pieces. This annoyed grandmother.

Q#8 Why does the author say, "Toto was a not the sort of pet we could keep for long"?

Ans. The author says so because the family is not well off and cannot afford the frequent loss of dishes, clothes, curtains and wallpaper. Toto also disturbed the other animals over there

Topic: Beauty

Central Idea: -This poem is an exemplary example of a romantic poem. It shows how the poet is completely enthralled by the beauty of his beloved. He says that he has seen the fascinating sights of nature created by the God but nothing on this planet is as beautiful as his beloved.

Summary: - The poem 'Beauty' has been composed by 'John Edward Masefield'. The poet describes the beauty of his beloved. He seems to be fascinated by her beauty and concludes that the beauty of his beloved is far better than the beauties of nature. In the starting lines, he describes the natural bounties. He says that he has experienced the daybreak and dusk on moors and hills full of winds. All these beauties appear in a formal and descent manner like the tunes of Spain which are known for their serious and slow rhythmic melody. He says that he has seen the beautiful spring season of April bringing daffodils;green springing grass and warm soothing rain. He has also been able to hear the beautiful tunes of slow rattling of blossoms and sound of sea waves. He has traveled to many places and has seen beautiful and strange lands from the ships. But at last he concludes that even after possessing such beautiful experiences, he finds the beauty of his beloved as the loveliest

creation of God. He is greatly impressed by the voice, hair, eyes and lips of his beloved and considers them superior to all.

Q#1 What are the various things of beauty the speaker has seen?

Ans. The speaker has seen many beautiful things like dawn and dusk on moors and windy hills; April season with daffodils, green grass and warm rain; sound of blossoms and sea waves; strange and beautiful lands.

Q#2 What are the loveliest of all these things God has shown to the poet?

Ans. The loveliest of all these things God has shown to the poet are the voice, hair, eyes and beautiful lips of his beloved.

Q#3 To whom do the words in the last line refer to?

Ans. The last line refers to the beloved of the poet.

Q#4 Why does the poet compare dawn and sunset to slow old tunes?

Ans. The poet compares the dawn and sunset to slow old tunes because the latter are played in a descent, formal manner. Similarly, the dawn and sunset appear in the same manner i.e. in a very disciplined, systematic and descent manner without any chaos.

Q#5 How does God's creation appear to the poet?

Ans. Everything that has been created by God seems beautiful to the poet. But he seems to be enthralled by the beauty of his beloved, which he considers the most beautiful of all the creations.

Learning About Literacy Devices:-

Q#6 What does the poet mean by the song of the blossoms?

Ans. By the song of blossoms, the poet means the sound produced by blossom due to slow, gentle wind.

Q#7 What is contrast between the last line and the rest of the poem? What does it suggest?

Ans. The contrast between the last line and the rest of the poem is the comparison between the beauty of nature and the beauty of his beloved.

It suggests that the poet loves his beloved deeply and is greatly impressed by her beauty. That is why the beauty of nature seems to be insignificant to him.

Topic: MotiGuj—The Mutineer

1) *Why did Moti-Guj love his master even though he would beat him sometimes?*
    a. MotiGuj loved his master very much even though he would beat him sometimes because he knew that his master would beat him only because of excessive drinking. Moreover, after the beating was over MotiGuj knew that his master would hug him and give him his favourite liquor.
2) *How long was Deesa to be away and how did he tell MotiGuj about this?*
    a. Deesa was supposed to be away from the plantation for ten days. Deesa had a peculiar way of making MotiGuj aware of his holidays. He took a tent-peg and hit MotiGuj ten times on the nails of his forefeet. In this way, he convinced his elephant about his holidays.
3) *What were the lies Deesa told his employer? Why did he tell such dreadful stories?*
    a. Deesa told three lies one after the other. At first, he told the planter that his mother had died but the planter reminded Deesa that he had told this lie twice before. Then Deesa told him that it was his aunt who had died. The planter was not convinced, so Deesa told the third lie that there was plague in his village due to which all his wives were dying. This also did not work because Chihun informed the planter that Deesa had not even a single wife. Deesa was not satisfied with the small amount of liquor he had. He wanted to take leave for some days in order to be properly drunk. That is why he told the planter these lies.
4) How did Deesa look after MotiGuj?
    a. Deesa looked after MotiGuj very affectionately. Once a week, he led MotiGuj into the river. The elephant would lay by his side and his master would bathe him with the help of a coir swab and a brick. Finally,he would carefully examine his eyes, ears and feet in case of sores.
5) How did MotiGuj bid Deesa good-by?
    a. MotiGuj puts trunk around Deesa and swung him twice in air. This was his way of bidding good bye to his master.
6) *Why did MotiGuj become a mutineer?*
    a. MotiGuj worked hard for ten days in spite of his loneliness without his master. But, when his master outstayed the leave and did not return on the said day, he became unmanageable and rebelled against the authorities. Thus, he became a mutineer.
7) *How did MotiGuj react to Desa's return?*
    a. When Deesa returned, he called his elephant using a mysterious elephant

language, in response to this, MotiGuj came running to his master and fell into his arms, trumpeting with joy. Both of them wept and slobbered each other.

8) *Why was Chihun angry with MotiGuj? How did MotiGuj react to his remarks?*

a. Chihun was angry with MoliGuj because he disobeyed him and refused to work on the plantation. He went out of the control and did not bother about Chihun's threats. He bent his ears forward and humped loudly in order to show violation against his temporary master.

Topic: The Road not Taken

Central Idea:- A human being gets many opportunities in life. These choices and decisions shape up the life of humans, it affects not only his future course of life on this earth but also his spiritual life after death.

Summary:- The poem "The Road Not Taken" has been penned down by "Robert Frost'. In this poem, the poet talks about making choices and the choices that shape us. The poet talks about two roads forked in a small wood in autumn season. He was standing there but was in a dilemma which road to be opted for. Since, he could not travel both the roads together, he stood gazing at the roads upto a point where the road bent behind the bushes. Finally, he decided to travel the other road which appeared to be as beautiful as the first one. Itappealed him because it was more grassy and untrodden. Then as he proceeded, he discovered that both the roads showed equal signs of wear. As he moved on, he found fewer people had travelled through the road. After exploring the road, he decided to try the next road for the next trip. But at the same time, he knew that there was little chance of coming back since every road lend to a new road.

In the last stanza, the poet leaves a sigh and imagines himself at a time many ages from there. He says that he will recall his choice of selecting the path. It is his decision only that made the difference and this decision affected not only his worldly life but eternal life as well.

Q1 Where does the traveler find himself? What problem does he face?

Ans :The travelerfinds himself at a place where the road bifurcated. He is in a dilemma which way to go by.

Q2: What is the difference between the two roads as described by the poet in Stanzas two and three?

Ans.One road, was grassy and less traveled by people while the other was much traveled and had turned black.

Q3 Which road does the poet choose? Does he regret his decision?

Ans.The poet chooses grassy and less traveled road. Yes, he regrets his decision.

Q4 Find the rhyme scheme of the poem.

Ans. The rhyme- scheme of the poem is abaab.

Q5 Explain the meaning of the following phrases:

a) Yellow wood:- It means a small forest, where the foliage has turned yellow because of autumn season.

b) Bent in the undergrowth:-A point where the road bents behind the bushes

c) Trodden black:- Turned black by being used much.

TOPIC ;Saint of the Gutters

Words	Meaning	Sentences
Flock	Gather or move in crowds	Whenever my uncle comes, the children of our locality flock to him.
Humble	Meek, modest, not proud.	One should always try to be humble.
Dignity	High rank	He is a man of dignity.
Mystic	One whose soul can communicate with God.	To be a mystic is not easy.
Desperate	Ready to do anything	I am desperate to get water.
Destitute	Extremely poor	We should help the destitute.
Devout	One who pays serious attention to his religious duties.	She is a devout Muslim
Devote	To dedicate one's life to a mission.	He has devoted his life to the service of humanity.

Q#1 What activities made Mother Theresa so exceptional?

Ans. Agnes who later became famous as Mother Theresa was a Catholic Christian. Right from her childhood, she walked away from the beaten track. She would enjoy doing religious duties like decorating the church for festivals and singing in the church choir. She was inclined to serve humanity.

She had reached the level of a mystic just at the age of fifteen when she heard her inner voice asking her to follow God and serve humanity. She worked for the benefit of the poor by setting up Nirmal Hriday, the home for the poor, the orphans and the dying.

So, she dedicated her life to the service of the poor and destitute. She lived a life of poverty and simplicity and won the hearts not only of the poor but also of the rich, famous and powerful people.

Q#2 Why did Mother Theresa leave St. Mary High School?

Ans. St. Mary High School was meant for the girls from rich backgrounds. While teaching there, Mother Theresa was not satisfied because her ambition was to serve the poor. So, she left the school in order to dedicate her life to the service of humanity.

Q#3 What did Mother Theresa mean by 'to fail would be to break faith'?

Ans. Mother Theresa strictly believed that God wanted her to obey his will by helping the poor and the destitute. He communicated with her through her soul and asked her to serve humanity. Thus, these words mean that if she failed in her work of helping the poor, it would mean that she broke the trust (faith) of God in her.

Q#4 What kind of life did Mother Theresa lead?

Ans. Mother Theresa lived the life of poverty and chastity. She dedicated her whole life to the service of humanity. She worked for the betterment of the poor, the orphans, the destitute and the dying.

Q#5 Why do you think Mother Theresa learnt Bengali?

Ans. Very early in her life, Mother Theresa had decided to come to India with a mission of helping the poor. She had resolved to go to Kolkata and serve the poorest of the poor in this part of the world. But for this she needed to make herself able to communicate with the people living there thus she learnt Bengali before starting her mission.

Q#6 What did Malcolm Muggeridge see on the streets of Calcutta?

Ans. Malcolm Muggeridge was a well known British writer. In 1970 he came to Koltata. One day while walking through a street, he saw Mother Theresa cleaning the sores on the body of a half- dead man. He was very surprised to see that this great woman was doing such a repelling job with utter happiness and satisfaction. She did not have even the slightest trace of disgust at the bad smell. He was quite impressed on seeing the glow of peace on Mother Theresa's face while serving the poor and treating the dying.

Topic: Sheikh Noor-ud-din Wali

Q1. Why did Sheikh Noor-ud-Din Wali enter the cave?

Ans. Sheikh-ul-Aalam preferred to live a life of isolation right from his childhood. He was not attracted by the pleasures of material world. Even after his marriage, when he had his own children, he was not attracted by the family life. He was very pious and lived a very simple life in isolation. To be isolated from the worldly affairs, he decided to enter the cave to purify himself spiritually through meditation and by doing penance.

Q2. What does Sheikh-uI-Aalam mean?

Ans. By the word 'sheikh-ul-Aalam' we mean 'spiritual guide of the world' or 'a saint of world stature'.

Q3. What kind of life did Sheikh-ul-Aalam lead?

Ans. He led a very simple, monastic and saintly life. His commitment to the principles of truth, justice and love reveals that he led a life of truthfulness and simplicity. He dedicated his whole life to the service of mankind and proved to be a true saint.

Q4. What did Sheikh-ul-Aalam teach the people?

Ans. He taught the people the true word of God. He preached the basic principles of Islam based on truth, justice, love and honesty. As a missionary, he taught that 'A true saint is the one who fulfills the duties of life with honesty, truthfulness and humanity and does not escape from worldly duties. In one of the verses from his book, he says that the chosen servants of God are those who worship him sincerely and fulfill their duties in life regularly.

He was not only the man of thoughts but also the man of actions. His life story is a practical example of his teachings which is sure to guide us and show us the real path.

Q5. What made people flock to Sheikh?

Ans. Sheikh's thoughts and pious life deeply impressed the people around him. He dedicated himself to the service of mankind. He spread the true message of God among the people and preached the basic fundamentals of Islam. The people from every nook and corner of the Kashmir Valley began to flock around him to seek spiritual guidance from this great saint.

Topic: Old Man at the Bridge

1) *Why were the old man's clothes dusty? Why did he not cross the bridge?*
   a. The old man's clothes were dusty because he had traveled a long distance on foot. He didn't cross the bridge because he was so tired that he couldn't go farther.
2) *Why did the old man leave San Carlos? Why did the old man want to go to Barcelona?*
   a. The old man left San Carlos because the army had to install artilleries there to defend their region from the attack of fascists. He wished to go to Barcelona in order to be safe from the attack of the enemies.
3) 'Oh, I said, not quite understanding. What was it about……..
   a. The statement 'I was taking care of animals didn't give a clear idea whether it was his profession or hobby. Moreover, his personality didn't give any clue of his being a shepherd or a herdsman.
4) *Where does the narrator expect the approaching battle to take place?*
   a. The narrator expected the approaching battle to take place in Ebro Delta.
5) 'It's better not to think about the others'. What does the old man…….
   a. By "the others" he means the other animals except the cat and four pairs of pigeons, i.e. the goats. He says so because he is well convinced by this fact that he cannot do anything about those animals which were left among the artillery. Thus, he is trying to comfort himself by thinking that they would be alright like the cat and pigeons.
6) Did the old man look upon his animals as his family? …….
   a. Yes, the old man looked upon his animals as his family. He seemed to be worried about those animals like the parents worry about their children.
   b. He was worried about them because he had left them at a place where the army was using artillery. So his fear and worry was natural.
   c. The artillery would harm his animals as per the old man because wars cause destruction of every living being on this earth i.e. both humans and animals.
7) The old man was a victim of war but he had no wish to play a part in it. How do……
   a. The old man was a victim of war but he had no wish to play a part in it because he was not in favour of any political party and thus was without politics. He was a common innocent man who suffers without any reason and has actually no role to play in the war. We come to know about this from the statement, 'I am without politics'.
8) *Wars have adverse effect on our lives. How does the story bring out this truth?*
   a. *W*ars certainly affect our lives adversely. This truth is clearly revealed from this story. The people are forced to leave their native places and are left helpless because of the wars. The atmosphere of the place becomes totally disturbed, mysterious and fearsome. Every creature seems to be in a continuous fear of death and destruction. Even the innocent animals are severely affected by the wars. Thus, wars create chaos and disturbance in the life of every living being.

Topic: I Cannot Remember My Mother

Sum and substance:-

Central Idea:- There is a great bond of love and affection between mother and her child. This association is such a strong one that even death cannot break it. The mother and her child keep on longing for each other whenever they are apart.

Summary:- The poem 'I Cannot Remember My Mother' has been penned down by 'Rabindra Nath Tagore'. The poet describes the sensitive and affectionate feelings of a child who has lost his mother when he was very young. He expresses the inability to recall the actual face and features of his mother but he uses various senses like sight, sound and smell to convey happy memories of his mother in him. The poet reveals his deep seated love for his mother by feeling her around every now and then. The poet says that when he is busy at play, suddenly a tune comes to his mind and he remembers that this tune used to be sung by his mother when she rocked his cradle. The poet further says that in autumn, the shiuli tree in Bengal, blossoms into fragrant tiny flowers which are used for the morning worship at temple. So, the powerful fragrance of these flowers makes him to recapitulate the happy memories of his mother. In the last stanza, the poet recalls the quiet, serene gaze of his mother at his face when he looks at the vast expanse of the clear blue sky and he feels that the caring look of his mother has spread all over the sky.

Questions

Q#1 What is the poet doing when he remembers his mother?
Ans. The poet is busy in playing when he remembers his mother.

Q#2 In what ways does the poet feel the presence of his mother?
Ans. The poet feels the presence of his mother by recalling the tune she used to hum; by the smell of chamomile flowers in temples and by the calmness and stillness of the sky which he compares to his mother.

Q#3 What does the poet hear when he is at play?
Ans. The poet hears a tune when he is at play and he considers it to be the same tune which his mother used to sing when she rocked his cradle to soothe him.

Q#4 What word do we use for the cradle song?
Ans. We use the word 'lullaby' for the cradle song.

Q#5 Is the poet's mother dead or alive? How do you come to know?
Ans. The poet's mother is dead because he seems to crave for his mother and uses his senses and various natural things to recall his mother. This clearly shows that she is not with him.

Q#6 What sights and smells remind the poet of his mother?
Ans. The sight of the calm sky and the smell of fragrant shiuli flowers remind the poet of his mother.

Q#7 What are the feelings that this poem arouses in you?
Ans. The poem makes us feel that mother and her child are closely associated and emotionally bound to each other. A mother forms an integral part of her child's life without whom he seems to be helpless and incomplete.

Topic: ON KILLING A TREE

***Central Idea*:** The killing of a tree can be compared to the violence involved in curbing and suppressing goodness. Although great efforts can be used to eradicate goodness from this globe but it is impossible to uproot the deep roots of virtue from this earth.

***Summary*:** The poem 'On Killing A Tree" has been penned down by 'Gieve Patel". This is a sarcastic poem in which the poet uses various criticisms against killing a tree. The poet says that a tree takes a long time to be uprooted because it has utilized various resources from earth like water, nutrients and has grown up into a well built tree which cannot be uprooted with a simple blow of a knife. It has consumed earthly resources to sprout leaves from its cracked bark. So in order to kill a tree, a lot of effort is needed. By heavy blows, the plant can be felled but the injured bark can heal and give rise to small branches which can grow to the former size, if neglected.

In the next stanza, the poet uses the sarcasm that it is impossible to uproot a plant completely with less effort. He says that to eradicate the plant from its native place, the root which is set deep in the earth, holding it very fast, is to be chopped out. Then after digging deep, one can find the lively and active part of the tree which is very sensitive and remains preserved in the deep layers of earth. Then, finally, the tree is to be-browned and hardened in sun to cause its withering otherwise it can develop roots and grow again. The poet depicts the fact that the truth takes a lot of time to be established and it is almost impossible to remove it from the earth otherwise, the existence on earth will cease to continue.

Ql. Growth of a tree is a long process; Killing of a tree is a longer process. Do you agree?

Ans. Growth of a tree is long process but the killing of a tree is a longer process. We certainly agree with it because in the course of time, the tree uses up all the resources of earth to grow into a stout, well built tree which is very difficult to be uprooted completely.

Q2. How has the tree grown to its full size? List the words suggestive of its life and activity.

Ans. The tree has grown to its full size by using resources of earth, absorbing water from it, developing various branches and leaves after consuming various nutrients. The words which suggest its life and activity are:

i) 'Bleeding bark':- It indicates that the plant is active and will heal quickly and then continue further growth.

ii) 'The resource i.e. main part of root which mainly causes growth is 'white and wet' indicating that the tree is very active.

iii) If the tree is left unchecked after being uprooted, it can develop 'miniature boughs' which can \ grow to former size.

Q3. What does the poet mean by the bleeding barks? What makes it bleed?

Ans. 'Bleeding bark" means the injured part of the tree where the plant has been uprooted. It is bleeding because of the jab of axe used in uprooting it.

Q4. The poet says 'No' in the beginning of the third stanza. What does it signify?

Ans. "No' in the third stanza is used as a criticism or a sarcastic expression. The poet says that even if we use great effort to uproot a plant but still it is impossible to destroy it completely.

Q5. What does the poet mean by the earth cave?

Ans. The 'earth cave' means the deep layers of earth in which the tree anchors its roots. Since, the root is fixed very deep that is why earth is compared to a cave which is known for its depth.

Q6. What according to the poet can kill a tree?

Ans. The complete uprooting of a tree from the deep layers of the earth and then sun drying it so that it becomes brown, hard, twisted and withered can kill a tree.

Learning About The Literary Devices:

Beginning with the title, what are words and images that are suggestive of violence in the poem?

Ans. The words which suggest violence in the poem are:

i) Jab of the knife. ii) Hack iii) Chop iv) Snapped v) Browning
vi) Hardening vii) Twisting viii) Withering
The images that are suggestive of violence in the poem:
i. The root is to be pulled out.
ii. It is to be roped, tied and pulled out- snapped out and pulled out entirely.

Topic: If I were you

1) *At last sympathetic audience.……..*
   a. Gerrard, the main character of the play says these words.
   b. He said this to win the confidence of the intruder.
   c. He is sarcastic.
2) *Why does the intruder chose Gerrard as the man whose identity he wants to take on?*
   a. The intruder is a thug and a fugitive. He has killed a cop and is being searched by police. He sees that Gerrard resembles him in his built and thus intends to kill and impersonate him to escape from the police.
3) "I said it with bullets"…….
   a. Gerrard says this.
   b. It means that Gerrard has also murdered someone and is a criminal.
   c. No, this is not the truth. He says this only to outwit the intruder. He wants to make him believe that he, too, is a criminal like him.
4) *What is Gerrard's profession? Quote the parts of the play that support your answer.*
   a. Gerrard was a playwright. He was working for some theatre group. We know this when he says in the end of the play, 'Sorry I cannot let you have the props in time for rehearsal. I think I'll, put it in my next play.
5) You will soon stop being smart!.....
   a. The intruder says this.
   b. He says this because Gerrard seems to be in lighter mood and seems to have no fear of death.
   c. Actually he is trying to scare him.
   d. Intruder threatens Gerrard that he would murder him.
6) They can't hang me twice…….
   a. These words are said by intruder.
   b. The intruder makes the remarks that he can't be hanged twice for the two murders, since he has already killed a cop and he doesn't mind even killing Gerrard.
7) 'A mystery I propose to explain".…….
   a. Gerrard wants to tell the intruder that he is not a Sunday school teacher. He is a criminal who has murdered someone and the police is after him.
8) "This is your big surprise"…….
   a. It has been said when the intruder is about to shoot Gerrard.
   b. Gerrard tells the intruder that he is also a killer and wanted by police. He says that one of his men has been caught and police is expected to come any moment. It is really a surprise for the intruder who warns to impersonate Gerrard and live a peaceful life.

Class IX - NCERT –Maths

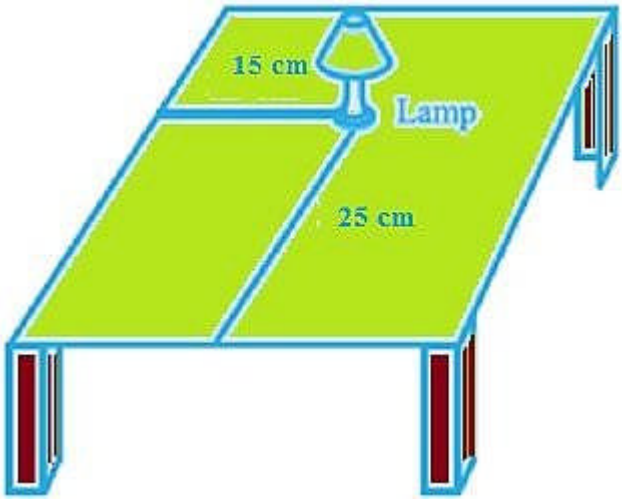
Exercise (3.1)

Question 1:

How will you describe the position of a table lamp on your study table to another person?

Solution 1:

Let us consider the given below figure of a study stable, on which a study lamp is placed.



From the Figure Above,

- Consider the lamp on the table as a point
- Consider the table as a plane.
- We can conclude that the table is rectangular in shape, when observed from the top.
  - The table has a short edge and a long edge.
  - Let us measure the distance of the lamp from the shorter edge and the longer edge.
  - Let us assume
    - Distance of the lamp from the shorter edge is 15 cm
    - Distance of the lamp from the longer edge, its 25 cm.

Therefore, we can conclude that the position of the lamp on the table can be described in two ways depending on the order of the axes as (15, 25) or (25, 15).

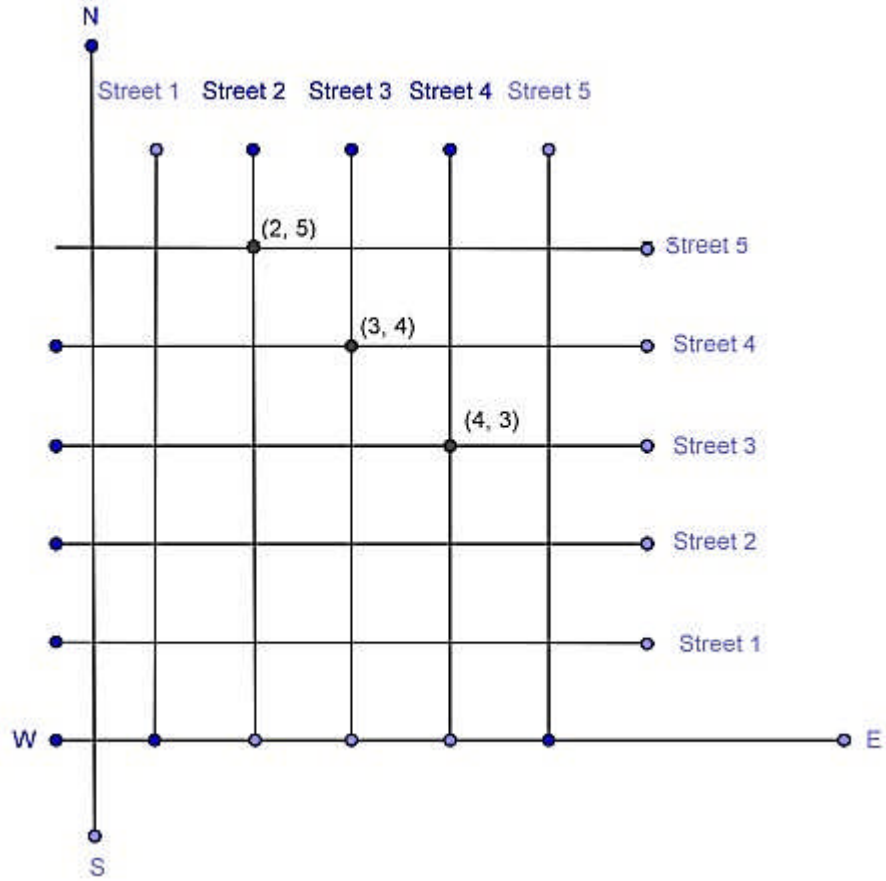
Question 2:

(Street Plan): A city has two main roads which cross each other at the center of the city. These two roads are along the North–South direction and East–West direction.
All the other streets of the city run parallel to these roads and are 200 m apart. There are 5 streets in each direction. Using 1 cm = 200 m, draw a model of the city on your notebook. Represent the roads/streets by single lines. There are many cross- streets in your model. A particular cross-street is made by two streets, one running in the North–South direction and another in the East–West direction. Each cross street is referred to in the following manner: If the 2nd street running

in the North–South direction and 5th in the East–West direction meet at some crossing, then we will call this cross-street (2, 5). Using this convention, find:
(i) How many cross - streets can be referred to as (4, 3).
(ii) How many cross - streets can be referred to as (3, 4).

Solution 2:

- Draw two perpendicular lines as the two main roads of the city that cross each other at the center
- Mark it as N–S and E–W.
- Let us take the scale as 1 cm = 200 m.
- Draw five streets that are parallel to both the main roads, to get the given below figure.



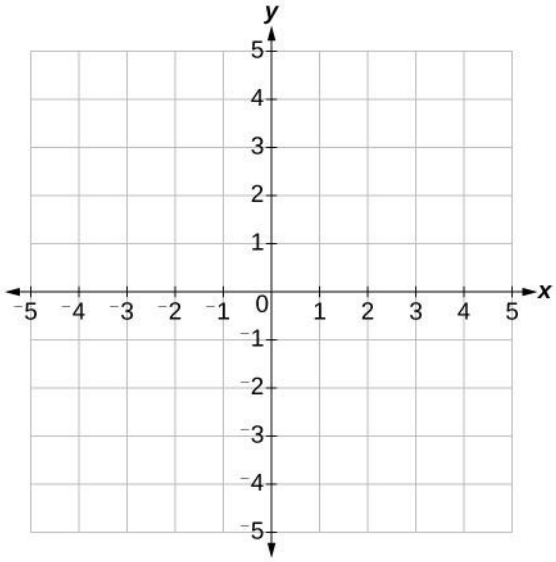
Street plan is as shown in the figure:
(i)There is only one cross street, which can be referred as (4, 3).
(ii)There is only one cross street, which can be referred as (3, 4).

Exercise (3.2)

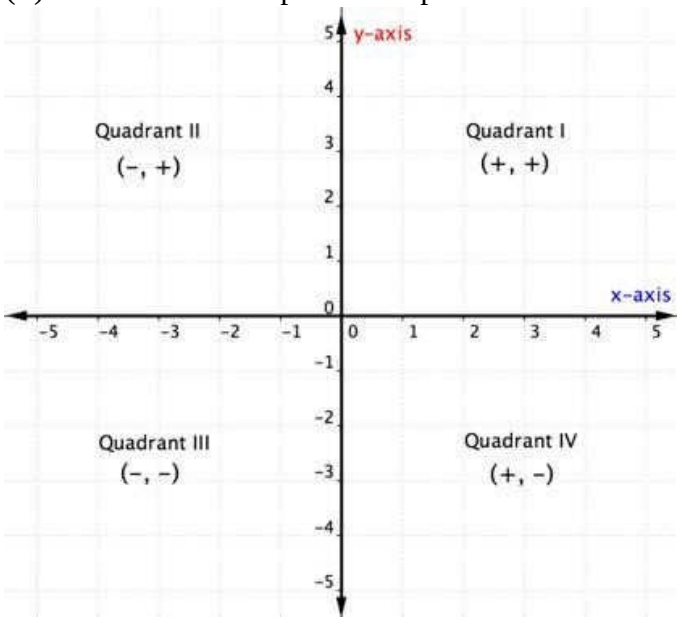
Question 1: Write the answer of each of the following questions:
(i)What is the name of horizontal and the vertical lines drawn to determine the position of any point in the Cartesian plane?
(ii)What is the name of each part of the plane formed by these two lines?
(iii)Write the name of the point where these two lines intersect.

Solution 1:
(i) The horizontal line that is drawn to determine the position of any point in the Cartesian plane is called as ***x*-axis**.

The vertical line that is drawn to determine the position of any point in the Cartesian plane is called as ***y*-axis**.

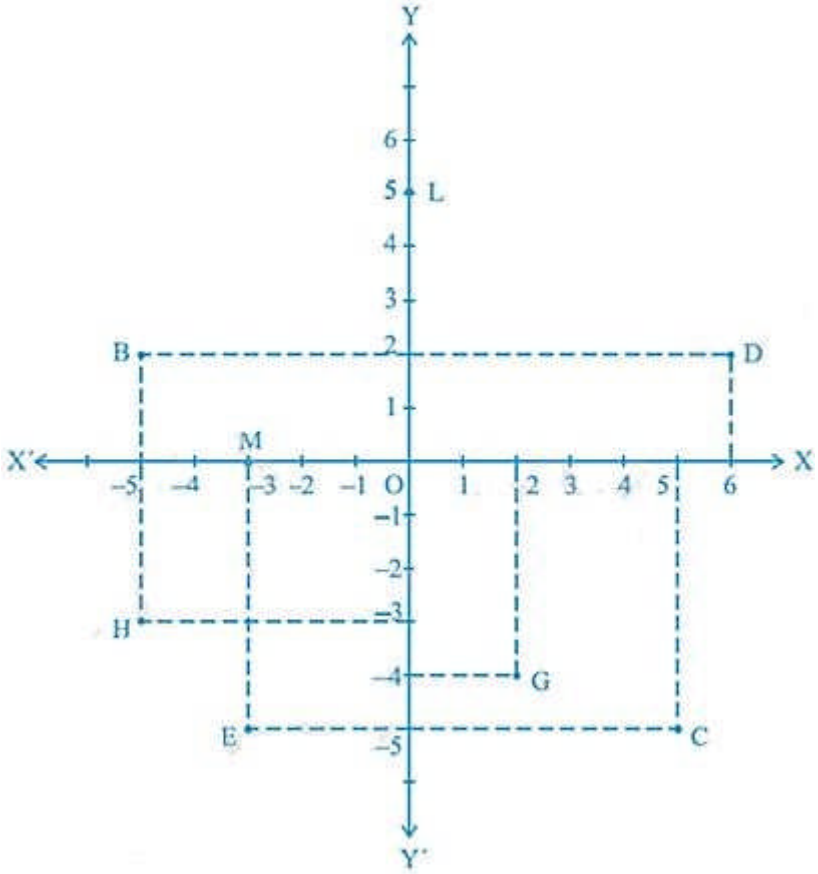


(ii)The name of each part of the plane that is formed by *x*-axis and *y*-axis is called as **quadrant**.



(iii)The point, where the *x*-axis and the *y*-axis intersect is called as **origin** (O)

Question 2: See the figure, and write the following:
(i)The coordinates of B.
(ii)The coordinates of C.
(iii)The point identified by the coordinates (–3, –5).
(iv)The point identified by the coordinates (2, –4).
(v)The abscissa of the point D.
(vi) The ordinate of the point H.
(vii)The coordinates of the point L.
(viii)The coordinates of the point M.



Solution 2:
From the Figure above,

(i) The coordinates of point B is the distance of point B from *x*-axis and *y*-axis. Therefore, the coordinates of point B are (–5, 2).

(ii) The coordinates of point C is the distance of point C from x-axis and y-axis. Therefore, the coordinates of point C are (5, –5).

(iii) The point that represents the coordinates (–3, –5) is E.

(iv) The point that represents the coordinates (2, –4) is G.

(v) The abscissa of point D is the distance of point D from the y-axis. Therefore, the abscissa of point D is 6.

(vi) The ordinate of point H is the distance of point H from the x-axis. Therefore, the abscissa of point H is _3.

(vii) The coordinates of point L in the above figure is the distance of point L from x-axis and y-axis. Therefore, the coordinates of point L are (0, 5).

(viii) The coordinates of point M in the above figure is the distance of point M from x-axis and y-axis. Therefore the coordinates of point M are (_3, 0).

Exercise (3.3)

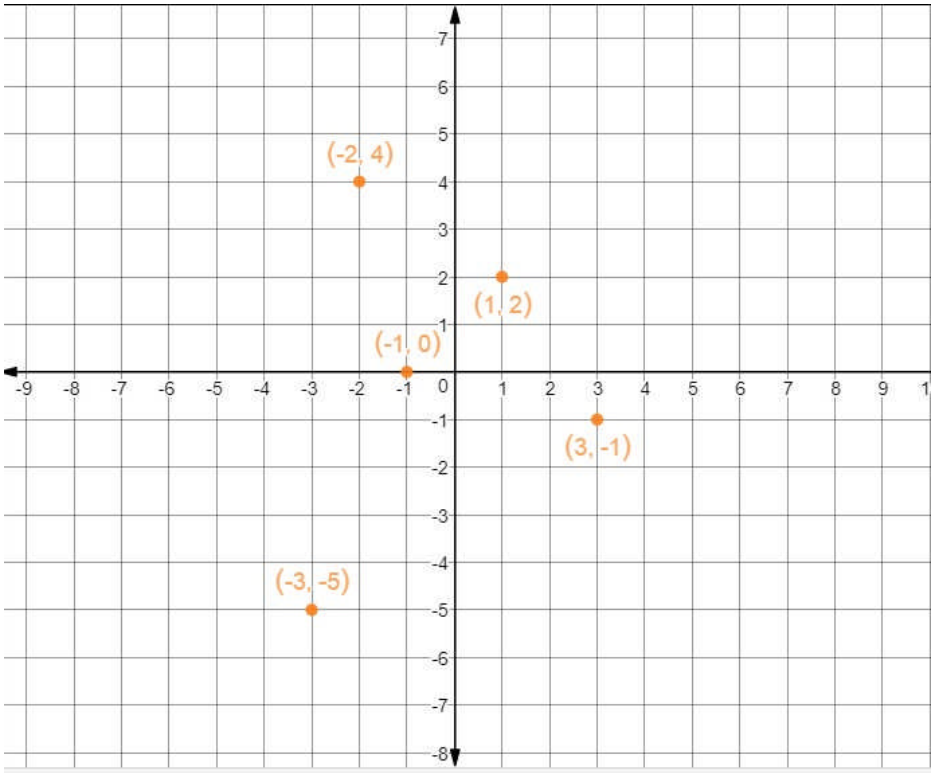
Question 1:

In which quadrant or on which axis do each of the points (_2, 4), (3, _1), (_1, 0), (1, 2) and (_3, _5) lie? Verify your answer by locating them on the Cartesian plane.

Solution 1:

To determine the quadrant or axis of the points (_2, 4), (3, _1), (_1, 0), (1, 2) and (_3, _5).

Plot the plot the points (_2, 4), (3, _1), (_1, 0), (1, 2) and (_3, _5) on the graph, to get



From the figure above, we can conclude that the points

- Point (–2, 4) lie in IInd quadrant.
- Point (3, –1) lie in IVth quadrant.
- Point (–1, 0) lie on the negative *x*-axis.
- Point (1, 2) lie in Ist quadrant.
- Point (–3, –5) lie in IIIrd quadrant.

Question 2:

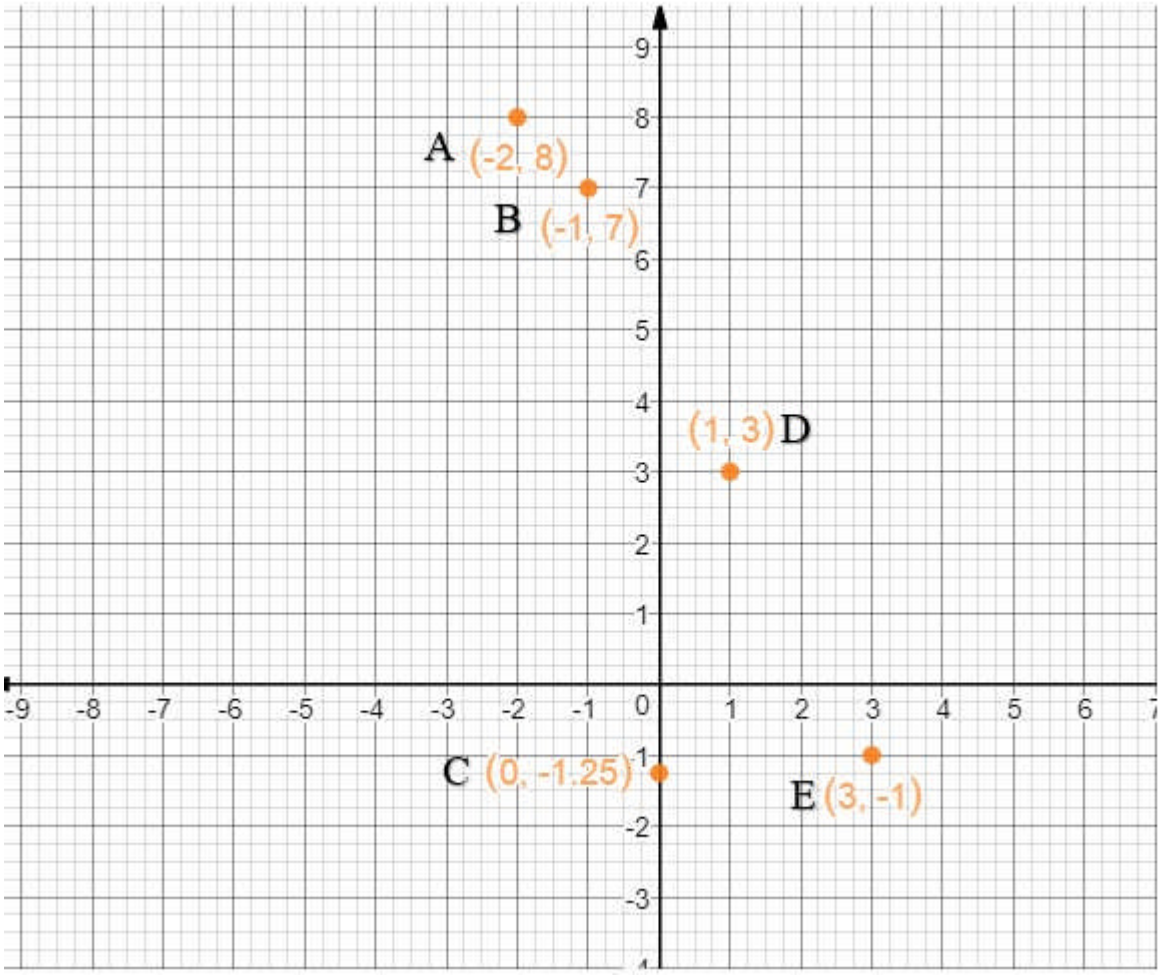
Plot the points (*x*, *y*) given in the following table on the plane, choosing suitable units of distance on the axes.

X	−2	−1	0	1	3
y	8	7	−1.25	3	−1

Solution 2:

Given,

X	−2	−1	0	1	3
y	8	7	−1.25	3	−1



Draw X'OX and Y'OY as the coordinate axes and mark their point of intersection O as the Origin (0, 0)

In order to plot the table provided above,

- Point A(–2, 8)
  - Take 2 units on OX' and then 8 units parallel to OY
- Point B (–1, 7)
  - Take -1 unit on OX' and then 7 units parallel to OY
- Point C(0, –1.25),
  - Take 1.25 units below x-axis on OY' on the y-axis
- Point D(1, 3)
  - Take 1 unit on OX and then 3 units parallel to OY
- Point E(3, –1),
  - Take 3 units on OX and then move 1 unit parallel to OY'

Exercise(4.1)

Question 1:

The cost of a notebook is twice the cost of a pen. Write a linear equation in two variables to represent this statement. (Take the cost of a notebook to be Rs. x and that of a pen to be Rs. y.)

Solution 1:

- Let the cost of a notebook be Rs.x
- Let the cost of a pen be Rs.y

Given: Cost of Notebook is twice the cost ofPen

Therefore, we can write the required linear equation in the

form of, Cost of notebook = 2 × Cost of pen

$x = 2y$

$x - 2y = 0$

Question 2:

Express the following linear equations in the form $ax + by + c = 0$ and indicate the values of a, b, c in each case:

(i) $2x + 3y = 9.3\overline{5}$

(ii) $x - \frac{y}{5} - 10 = 0$

(iii) $-2x + 3y = 6$

(iv) $x = 3y$

(v) $2x = -5y$

(vi) $3x + 2 = 0$

(vii) $y - 2 = 0$

(viii) $5 = 2x$

Solution 2:

(i) $2x + 3y = 9.3\overline{5}$ ---------- Equation (1)

$2x + 3y - 9.3\overline{5} = 0$

Comparing this equation with standard form of the linear equation, $ax + by + c = 0$ we have,

- $a = 2$,
- $b = 3$,
- $c = -9.3\overline{5}$

(ii) $x-\frac{y}{5}-10=0$ ---------- Equation (1)

Comparing Equation (1) with standard form of the linear equation, $ax + by + c = 0$ we have,

- $a = 1$,
- $b = -\frac{1}{5}$,
- $c = -10$

(iii) $-2x + 3y = 6$ ----------Equation(1)

$-2x + 3y - 6 = 0$

Comparing this equation with standard form of the linear equation, $ax + by + c = 0$ we have,

- $a = -2$,
- $b = 3$,
- $c = -6$

(iv) $x = 3y$ ---------- Equation(1)

$1x - 3y + 0 = 0$

Comparing this equation with standard form of the linear equation, $ax + by + c = 0$ we have,

- $a = 1$,
- $b = -3$,
- $c = 0$

(v) $2x = -5y$---------- Equation(1)

$2x + 5y + 0 = 0$

Comparing this equation with standard form of the linear equation, $ax + by + c = 0$ we have,

- $a = 2$,
- $b = 5$,
- $c = 0$

(vi) $3x + 2 = 0$ ---------- Equation(1)

We can write Equation (1) as below,

$3x + 0y + 2 = 0$

Comparing this equation with $ax + by + c = 0$,

- $a = 3$,
- $b = 0$,
- $c = 2$

(vii) $y - 2 = 0$ ---------- Equation(1)

We can write Equation (1) as below,

$0x + 1y - 2 = 0$

Comparing this equation with standard form of the linear equation, $ax + by + c = 0$ we have,

- $a = 0$,

- $b = 1$,
- $c = -2$

(viii) $5 = 2x$ ----------Equation(1)
$-2x + 0y + 5 = 0$
Comparing this equation with standard form of the linear equation, $ax + by + c = 0$ we have,

- $a = -2$,
- $b = 0$,
- $c = 5$

Exercise (4.2)

Question 1:
Which one of the following options is true, and why? $y = 3x + 5$ has

(i) A unique solution, (ii) only two solutions, (iii) infinitely manysolutions

Solution 1:

Given:

- y = 3 x + 5 is a linearEquation.
- For x = 0, y = 0 + 5 = 5 Therefore, (0, 5) is anothersolution.
- For x = 1, y = 3 × 1 + 5 = 8 Therefore (1, 8) is anothersolution.
- For y = 0 , 3x + 5 = 0 is the one solution

Clearly, for different values of x, we get another value ofy.

Thus, the chosen value of x together with this value of y constitutes another solution of the given equation.

So, there is no end to different solutions of a linear equation in two variables. Therefore, a linear equation in two variables has infinitely many solutions

Hence (iii) is the correct answer

Question 2:

Write four solutions for each of the following equations:

(i) $2x + y = 7$

(ii) $\pi x + y = 9$

(iii) $x = 4y$

Solution 2:

(i) 2x + y = 7

Given,

- Linear Equation, 2x + y =7
  We can write the above equation as below by simplifying
  y =7-2x ---------- Equation(1)

Let us now take different values of x and substituting in the Equation (1), we get

- For x = 0,
  2(0) + y =7
  ⇒ y = 7
  Hence, we get (x, y) = (0, 7)

- For x = 1,
  2(1) + y =7
  ⇒ y = 5
  Hence, we get (x, y) = (1, 5)

- For x = 2,
  2(2) + y =7
  ⇒ y = 3
  Hence, we get (x, y) = (2, 3)

- For x =3,
  2(3) + y = 7
  ⇒ y = 1
  Hence we get (x, y) = (3, 1)

Therefore the four solutions of the given equation are (0,7) , (1,5), (2, 3), (3,1)

(ii) $\pi x + y = 9$

Given,

- Linear Equation, $\pi x + y = 9$
  We can write the above equation as below by Transposing
  $y = 9 - \pi x$ ---------- Equation(1)

Let us now take different values of x and substituting in the Equation (1), we get

- For x =0,
  $y = 9 - \pi(0)$
  $\Rightarrow y = 9$

  Hence we get (x, y) = (0, 9)

- For x =1,
  $y = 9 - \pi(1)$
  $= 9 - \pi$

  Hence we get (x, y) = $(1, 9 - \pi)$

- For x =2,
  $y = 9 - \pi(2)$

  Hence we get (x, y) = $(2, 9 - 2\pi)$

- For x =3,
  $y = 9 - \pi(3)$

  Hence we get (x, y) = $(3, 9 - 3\pi)$

Therefore the four solutions of the given equation are (0, 9), (1,9 -), (2,9−2), (3, 9-3)

(iii) x =4y

Given,

- Linear Equation, x =4y
  We can write the above equation as below by Transposing
  $y = x/4$ ---------- Equation(1)

Let us now take different values of x and substituting in the Equation (1), we get

- For x = 0,
  $y = 0/4 = 0$

  Hence we get (x, y) = (0, 0)

- For x = 1,
  y =1/4

Hence we get (x, y) = (1, 1/4)

- For x =2,
  y = 2/4 = 1/2

Hence we get (x, y) = (2, 1/2)

- For x = 3,
  y =3/4

Hence we get (x, y) = (3, 3/4)

Therefore the four solutions of the given equation are (0, 0), (1, 1/4), (2, 1/2), (3, 3/4)

Question 3:

Check which of the following solutions of the equation are $x - 2y = 4$ and which are not:

(i) (0, 2)

(ii) (2, 0)

(iii) (4, 0)

(iv) ($\sqrt{2}$, 4$\sqrt{2}$)

(v) (1, 1)

Solution 3:

Given **:** $x - 2y = 4$ is aLinearEquation---------- Equation(1)

(i) (0, 2)

B Substituting x = 0 and y = 2 in the L.H.S of the given Equation (1)

$x - 2y$

$= (0) - (2)\ 2$

$= -4 \neq 4 \neq$ RHS

L.H.S ≠ R.H.S

Therefore, (0, 2) is not a solution of this equation.

(ii) (2, 0)

By Substituting, x = 2 and y = 0 in the L.H.S of the given Equation (1),

$x - 2y$

$= 2 - 2(0)$

$= 2 \neq 4 \neq$ RHS

L.H.S ≠ R.H.S

Therefore, (2, 0) is not a solution of this equation.

(iii) (4, 0)

By Substituting, x = 4 and y = 0 in the L.H.S of the given Equation (1)

$x - 2y$

$= 4 - 2(0)$

$= 4$

L.H.S = R.H.S

Therefore, (4, 0) is a solution of this equation.

(iv) (2, 4 2)

By Substituting, $x =$ 2and $y = 4\ 2$ in the L.H.S of the given Equation (1)

$x - 2y$

$= \quad 2 - 82$

$= - 7\ 2 \neq 4 \neq RHS$

L.H.S ≠ R.H.S

Therefore, is not a solution of this equation.

(v) (1, 1)

By Substituting, x = 1 and y = 1 in the L.H.S of the given Equation (1)

x − 2y

= 1 − 2(1)

= 1 − 2

= − 1 ≠ 4 ≠ RHS

L.H.S ≠ R.H.S

Therefore, (1, 1) is not a solution of this equation.

Question 4:

Find the value of *k*, if *x* = 2, *y* = 1 is a solution of the equation 2*x* + 3*y* = *k*.

Solution 4:

Given **:** 2x + 3y = k is theLinearEquation ---------- Equation(1)

- x =2
- y =1
- k=?

By substituting the values of x and in the Equation (1),

2x + 3y = k

⇒ 2(2) + 3(1) = k

⇒ 4 + 3 = k

⇒ Hence, k = 7

Therefore, the value of *k* is 7.

Exercise (4.3)

Question 1:

Draw the graph of each of the following linear equations in two variables:

(i) $x + y = 4$

(ii) $x – y = 2$

(iii) $y = 3x$

(iv) $3 = 2x + y$

Solution 1:

(i) $x + y = 4$

Given : Linear Equation

$$x + y = 4 \Rightarrow y = 4 – x \text{----------Equation(1)}$$

By substituting the different values of x in the Equation (1) we get different values for y

- When $x = 0$, we have : $y = 4 – 0 = 4$
- When $x = 2$, we have : $y = 4 – 2 = 2$
- When $x = 4$, we have : $y = 4 – 4 = 0$

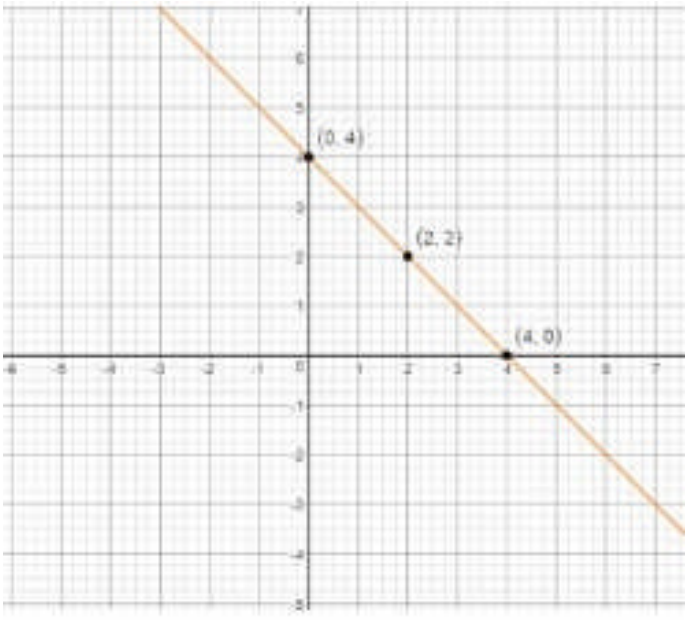
Thus, we have the following table with all the obtained solutions:

x	0	2	4
y	4	2	0

By Plotting the points (0, 4) (2, 2) and (4, 0) on the graph paper and drawing a line joining them, we obtain the Graph.

The graph of the line represented by the given equation as shown.

The graph of this equation is constructed as follows:



(ii) $x - y = 2$

Given : Linear Equation

$x - y = 2 \Rightarrow y = x - 2$ ---------- Equation(1)

By substituting the different values of x in the Equation (1) we get different values for y

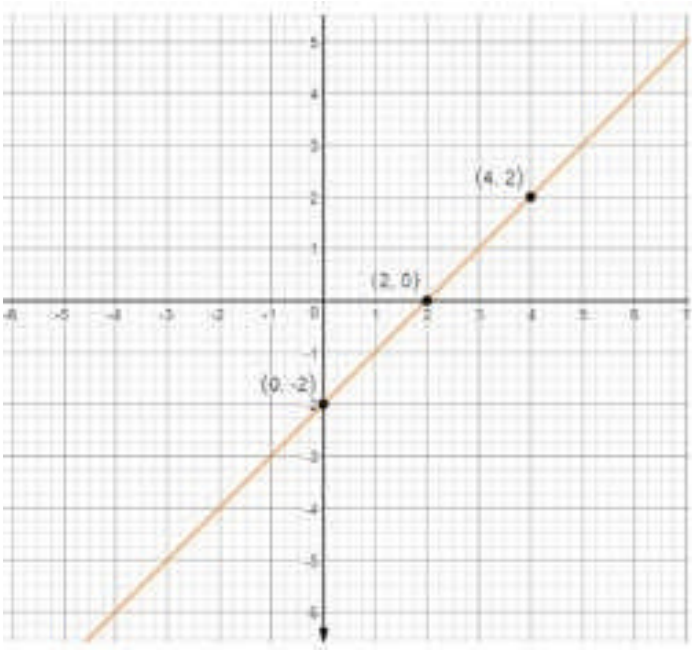
- When $x = 0$, we have $y = 0 - 2 = -2$
- When $x = 2$, we have $y = 2 - 2 = 0$
- When $x = 4$, we have $y = 4 - 2 = 2$

Thus, we have the following table with all the obtained solutions:

x	0	2	4
y	-2	0	2

By Plotting the points (0, –2), (2, 0) and (4, 2) on the graph paper and drawing a line joining them, we obtain the Graph.

The graph of the line represented by the given equation as shown



(iii) $y = 3x$

Given: Linear Equation

$y=3x$ ---------- Equation (1)

By substituting the different values of x in the Equation (1) we get different values for y

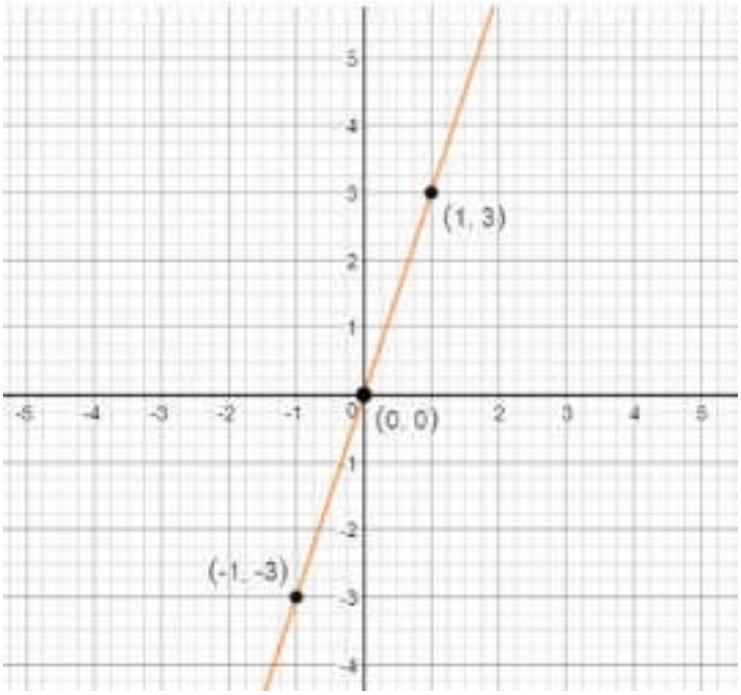
- When x = 0 , we have : y = 3(0) =0
- When x = 1, we have : y = 3 (1) =3
- When x = –1, we have : y = 3(–1) = –3

Thus, we have the following table with all the obtained solutions:

x	0	1	-1
y	0	3	-3

By Plotting the points (0, 0), (1, 3) and (–1, –3) on the graph paper and drawing a line joining them, we the Graph.

The graph of the line represented by the given equation as shown:



(iv) $3 = 2x + y$

Given: $3 = 2x + y$ be the Linear Equation

$\Rightarrow y = 3 - 2x$ ---------- Equation(1)

By substituting the different values of x in the Equation (1) we get different values for y

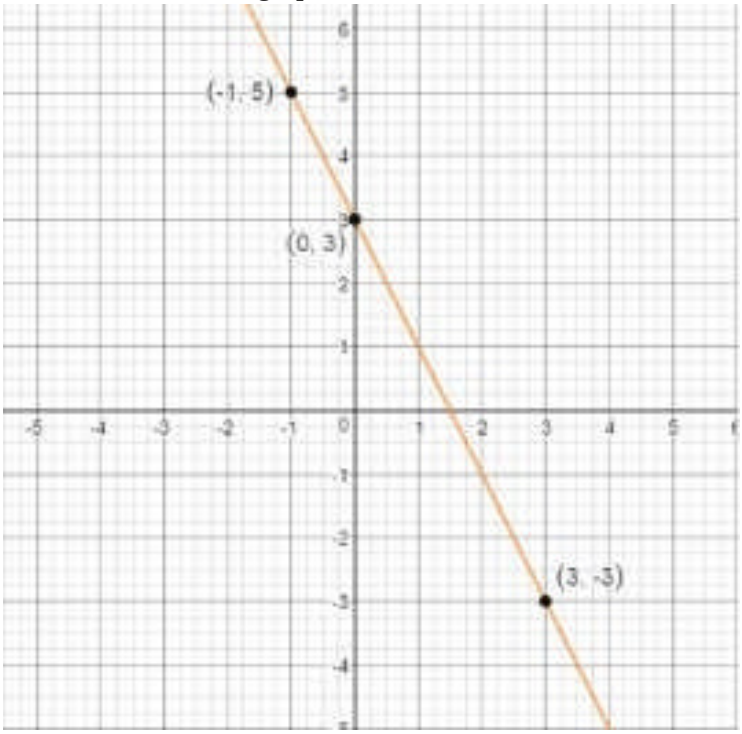
- When x = 0, we have: y = 3 – 2(0) = 3 – 0 =3
- When x = 3, we have: y = 3 – 2(3) = 3 – 6 = –3
- When x = – 1, we have: y = 3 – 2 (–1) = 3 + 2 = 5

Thus, we have the following table with all the obtainedsolutions:

x	0	3	-1

y	3	-3	5

By Plotting the points (0, 3), (3, –3) and (–1, 5) on the graph paper and drawing a line joining them, we obtain the graph:



The graph of the line represented by the given equation as shown.

Question 2:

Given the equations of two lines passing through (2, 14). How many more such lines are there, and why?

Solution 2:

Given :

- Equations of two lines passing through (2,14).
- It can be observed that point (2, 14) satisfies the equation $7x - y = 0$ and $x - y + 12 = 0$.

Therefore, $7x - y = 0$ and $x - y + 12 = 0$ are two lines passing through point (2, 14).

As it is known that through one point, infinite number of lines can pass through, therefore, there are infinite lines of such type passing through the given point.

Question 3:

If the point (3, 4) lies on the graph of the equation $3y = ax + 7$, find the value of a.

Solution 3:

Given **:**

- 3y = ax + 7 is theLinearEquation----------Equation(1)
- Point (3, 4) lies on the Equation(1)

By Substituting the value of x = 3 and y = 4 in the Equation (1),

3y = ax + 7

3(4) = a(3) + 7

5 = 3a

We get, $a = \frac{5}{3}$

Question 4:

The taxi fare in a city is as follows: For the first kilometre, the fares is Rs. 8 and for the subsequent distance it is Rs. 5 per km. Taking the distance covered as *x* km and total fare as Rs. *y*, write a linear equation for this information, and draw its graph.

Solution 4:

Given,

- Fare for 1st kilometer = Rs.8
- Taxi fare for the subsequent km = Rs5
- Fare for the rest of the distance = Rs. (x − 1)5
- Let the Total distance covered = *x*km
- Let the Total fare covered = Rs.y

The linear equation for the above information is given by,

Total fare, y = [8 + (x − 1) 5]

y = 8 + 5x − 5

y = 5x + 3

5x − y + 3 = 0

By substituting the different values of x in the Equation (1) we get different values for y

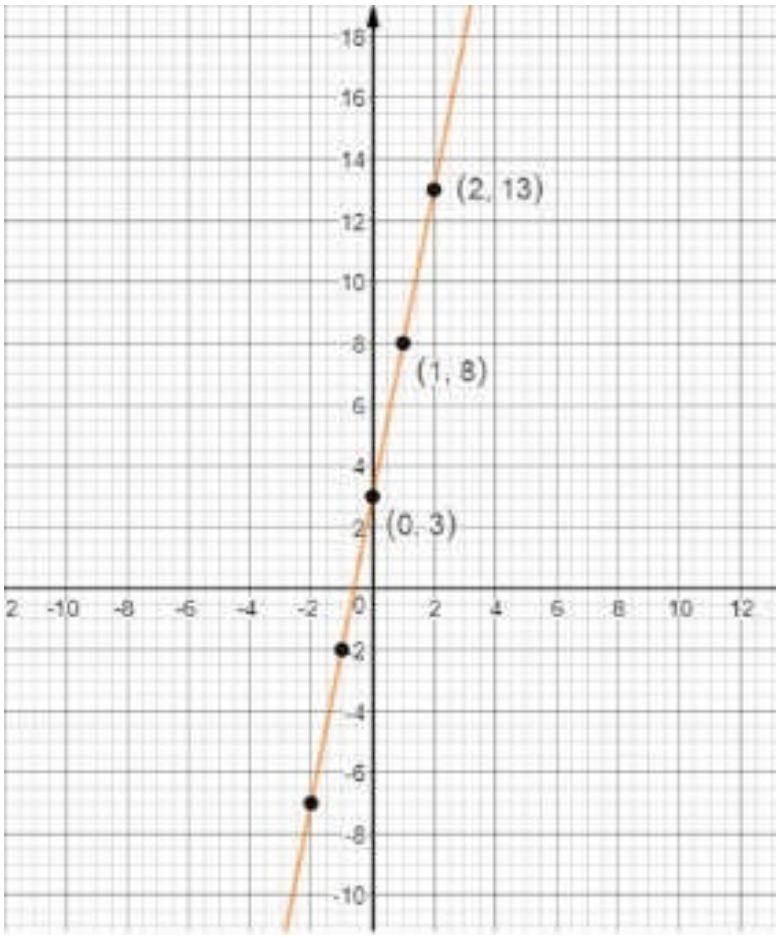
- When x = 0, y = 5 × 0 + 3 = 0 + 3 =3
- When x = 1, y = 5 ×(1) + 3 = 5 + 3 =8
- When x = 2, y = 5 × (2) + 3 = 10 + 3 =13
- When x = -1, y = 5 × (–1) + 3 = –5 + 3 =-2
- When x = -2, y = 5 × (–2) + 3 = –10 + 3 =-7

Thus, we have the following table with all the obtained solutions:

x	0	1	2	-1	-2
y	3	8	13	-2	-7

By Plotting the points (0, 3), (1, 8) , (2, 13) , (-1, -3) , (-2, -7) on the graph paper and drawing a line joining them, we, obtain the required graph

The graph of the line represented by the given equation as shown:



Here, it can be seen that variable x and y are representing the distance covered and the fare paid for that distance respectively and these quantities may not be negative.
Hence, only those values of x and y which are lying in the 1st quadrant will be considered.

Question 5:

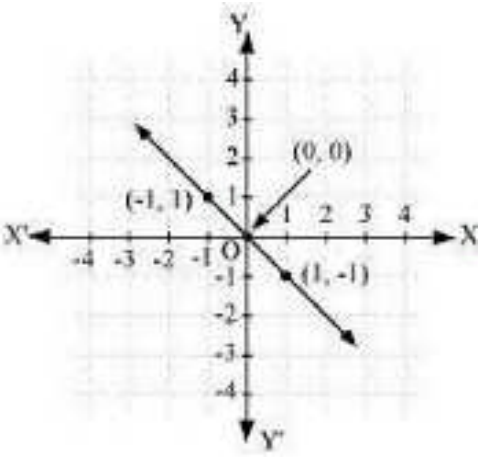
From the choices given below, choose the equation whose graphs are given in the given figures.

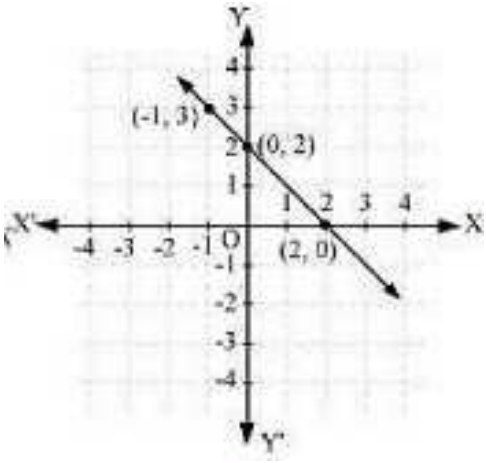
For thefirstfigure

(i) y=x
(ii) x + y= 0
(iii) y=2x
(iv) 2 + 3y=7x

For the secondfigure

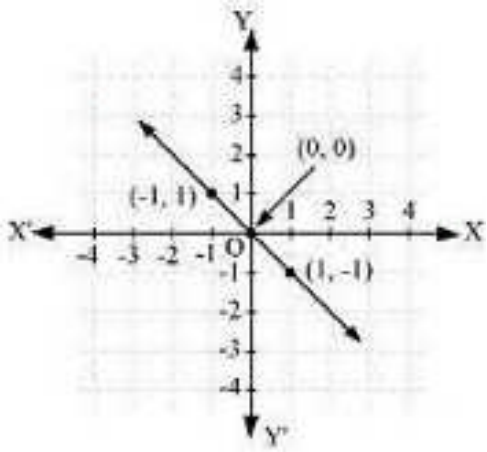
(i) y = x+2
(ii) y = x −2
(iii) y = − x + 2
(iv) x + 2y =6





Solution 5:

For the First Figure:

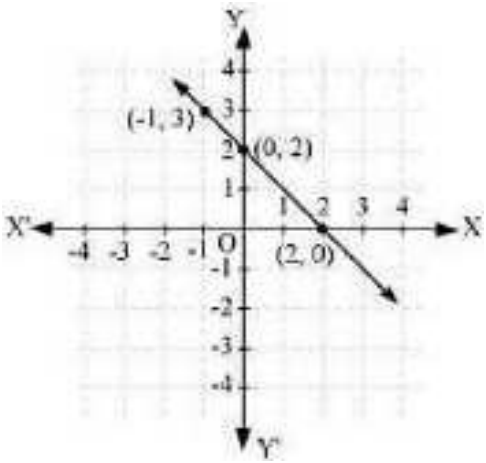


- Points on the given line are (−1, 1), (0, 0), and (1,−1).
- It can be observed that the coordinates of the points of the graph satisfy the equation $x + y = 0$.

Therefore, $x + y = 0$ is the equation corresponding to the graph as shown in the first figure.

Hence, (ii) is the correct answer.

For the Second Figure :



- Points on the given line are (−1, 3), (0, 2), and (2,0).
- It can be observed that the coordinates of the points of the graph satisfy the equation y = −x + 2. Therefore, y = −x + 2 is the equation corresponding to the graph shown in the second figure. Hence, (iii) is the correctanswer.

Question 6:

If the work done by a body on application of a constant force is directly proportional to the distance travelled by the body, express this in the form of an equation in two variables and draw the graph of the same by taking the constant force as 5 units. Also read from the graph the work done when the distance travelled by the body is
(i) 2 units (ii) 0units

Solution 6:

Given:

- Let the distance travelled and the work done by the body be x and yrespectively.
- Work done ∝ distance travelled
  Hence, y ∝x

y=kx ----------Equation(1)
Where, k is a constant
By substituting the different values of x in the Equation (1) we get different values for y

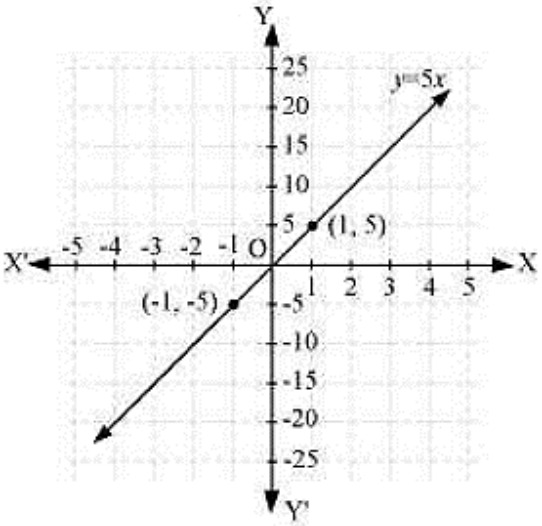
- When x= 0, y =0
- When x= 1, y =5
- When x =-1, y=-5

Thus, we have the following table with all the obtained solutions:

x	0	1	-1
y	0	5	-5

By Plotting (0, 0) , (1,5) and (–1, –5) on the graph paper and drawing a line joining them we obtain the required graph

The graph of the line represented by the given equation as shown.



(i) From the graphs, it can be observed that the value of y corresponding to x = 2 is 10. This implies that the work done by the body is 10 units when the distance travelled by it is 2units.

(ii) From the graphs, it can be observed that the value of y corresponding to x = 0 is 0. This implies that the work done by the body is 0 units when the distance travelled by it is 0unit.

Question 7:

Yamini and Fatima, two students of Class IX of a school, together contributed Rs. 100 towards the Prime Minister's Relief Fund to help the earthquake victims. Write a linear equation which satisfies this data. (You may take their contributions as Rs. *x* and Rs. *y*.) Draw the graph of the same.

Solution 7:

Given,

- Let the amount that Yamini and Fatima contributed be x and y respectively towards the Prime Minister's Relieffund.
- Amount contributed by Yamini and Fatima together would be = 100
  x + y =100
  y = 100- x

By substituting the different values of x in the Equation (1) we get different values for y

- When x = 0, y =100
- When x = 50, y =50
- When x = 100, y =0

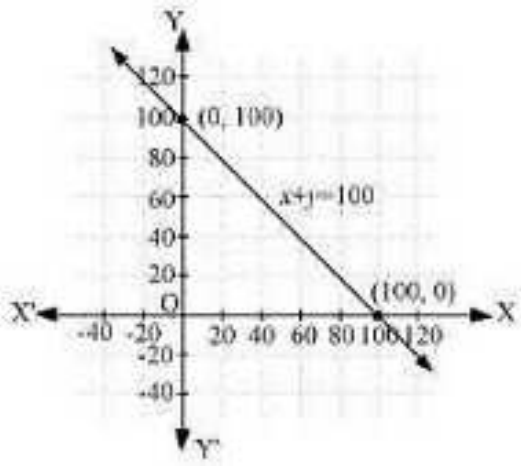
Thus, we have the following table with all the obtained solutions:

x	0	50	100
y	100	50	0

By Plotting the points (0, 100), (100, 0) and (50, 50) on the graph paper and drawing a line

joining them, we obtain the required graph

The graph of the line represented by the given equation as shown.



Here, it can be seen that variable x and y are representing the amount contributed by Yamini and Fatima respectively and these quantities cannot be negative. Hence, only those values of x and y which are lying in the 1st quadrant will be considered.

Question 8:

In countries like USA and Canada, temperature is measured in Fahrenheit, whereas in countries like India, it is measured in Celsius. Here is a linear equation that converts Fahrenheit to Celsius:

$$F = \left(\frac{9}{5}\right)C + 32$$

(i) Draw the graph of the linear equation above using Celsius for *x*-axis and Fahrenheit for*y*-axis.
(ii) If the temperature is 30 °C, what is the temperature inFahrenheit?
(iii) If the temperature is 95 °F, what is the temperature inCelsius?
(iv) If the temperature is 0 °C, what is the temperature in Fahrenheit and if the temperature is 0 °F, what is the temperature in Celsius?
(v) Is there a temperature which is numerically the same in both Fahrenheit and Celsius? If yes, findit.

Solution 8:

(i)
Given,

- $F = \left(\frac{9}{5}\right)C + 32$ Equation(1)

By substituting the different values of x in the Equation (1) we get different values for y

- When C = 0,

$$F = \left(\frac{9}{5}\right)0 + 32 = 32$$

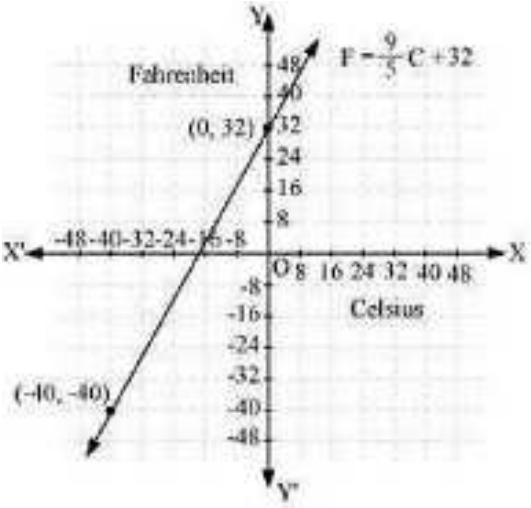
- When C = – 40, F =-40
- When C = 10, F =50

Thus, we have the following table with all the obtained solutions:

x	0	-40	10
y	32	-40	50

By Plotting the points (– 40, – 40) and (10, 50) on the graph point. On joining these points by line segment we obtain the required graph

The graph of the line represented by the given equation as shown.



(ii) Given:

- Temperature = 30 °C
- F=?

We know that, $F = \left(\frac{9}{5}\right)C + 32$

By Substituting the value of temperature in the Equation above,

$F = \left(\frac{9}{5}\right)30 + 32 = 54 + 32 = 86$

Therefore, the temperature in Fahrenheit is 86 °F.

(iii) Given,

- Temperature = 95 °F
- F =?

We know that, $F = \left(\frac{9}{5}\right)C + 32$

By Substituting the value of temperature in the Equation above,

$$95 = \left(\frac{9}{5}\right)C + 32$$

$$63 = \left(\frac{9}{5}\right)C$$

C = 35

Therefore, the temperature in Celsius is 35 °C.

(iv) We knowthat, $F = \left(\frac{9}{5}\right)C + 32$

If C = 0 °C, then by Substituting this value in the Equation above,

$$F = \left(\frac{9}{5}\right)0 + 32 = 32$$

Therefore, if C = 0 °C, then F = 32 °F

If F = 0 °F, then by Substituting this value in the Equation above,

$$0 = \left(\frac{9}{5}\right)C + 32$$

$$\left(\frac{9}{5}\right)C = -32$$

$$C = \frac{-160}{9} = -17.77$$

Therefore, if F = 0 °F, then C = −17.8 °C

(v) We knowthat, $F = \left(\frac{9}{5}\right)C + 32$

Let us consider, F = C

By Substituting this value in the Equation above,

$$F = \left(\frac{9}{5}\right)F + 32$$

$$\left(\frac{9}{5} - 1\right)F + 32 = 0$$

$$\left(\frac{4}{5}\right)F = -32$$

Hence, F = –40

Yes, there is a temperature, −40°, which is numerically the same in both Fahrenheit and Celsius.

Exercise (4.4)

Question 1:

Give the geometric representation of y = 3 as an equation

(i) in one variable

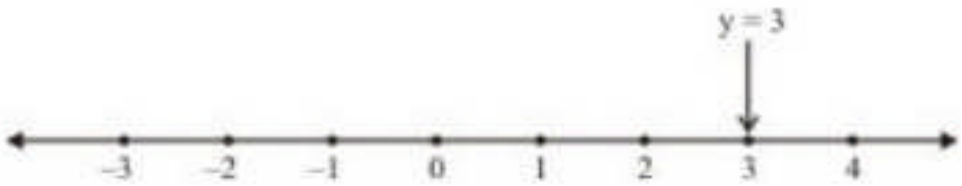
(ii) in two variables

Solution 1:

(i) Given,

- y = 3 is theequation
- The representation of the solution on the number when y = 3 is treated as an equation in one variable

In one variable, y = 3 represents a point as shown in following figure.



(ii) Given:

- y = 3 is theequation

We know that y = 3 can be written as 0.x + y = 0 .

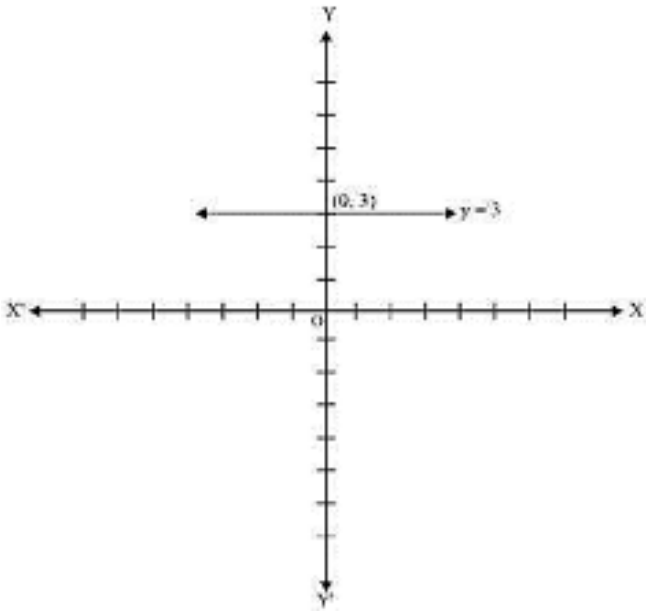
In two variables, y = 3 represents a straight line passing through point (0, 3) and parallelto *x*-axis. It is a collection of all points of the plane, having their *y*-coordinate as3.

Hence,

- When, x = 0, we get y = 3;
- When x = 2, we get y = 3;
- When x = - 2 , we get y = 3 are the solutions for theequations.

Plotting the points (0, 3) (2, 3) and (–2, 3) and on joining them we get the graph AB as a line parallel to x-axis at a distance of 3 units above it

The graphical representation is shown below:



Question 2:

Give the geometric representations of 2x + 9 = 0 as an equation

(i) in one variable

(ii) in two variables

Solution 2:

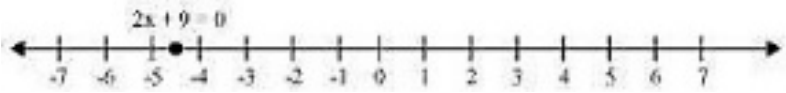
(i) Given: 2x + 9 = 0 is theLinearEquation ---------- Equation(1)

$2x + 9 = 0$

$2x = 9$

$x = \frac{-9}{2} = -4.5$

Hence, in one variable 2x + 9 = 0 represents a point as shown in the following figure.



(ii) Given: 2x + 9 = 0 is theLinearEquation ----------Equation(1)

We know that 2x + 9 = 0 can be written as 2x + 0y + 9 = 0 as a linear equation in variables x and y.

Value of y is always 0. However, x must satisfy the relation 2x + 9= 0

i.e. $x = \frac{-9}{2} = -4.5$

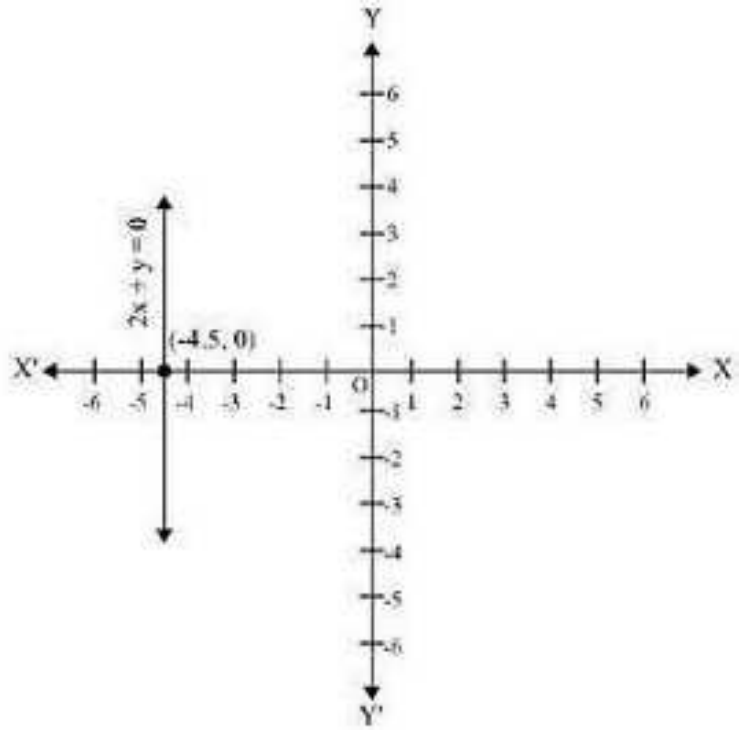
Hence,

- When, y= 0, we get x= -4.5;

- When y = 2, we get x=-4.5;
- When y = - 2, we get x= -4.5 are the solutions for theequations.

Hence three solution of the given equation are, y = 0 ; ,y = 2 and ,y =– 2.

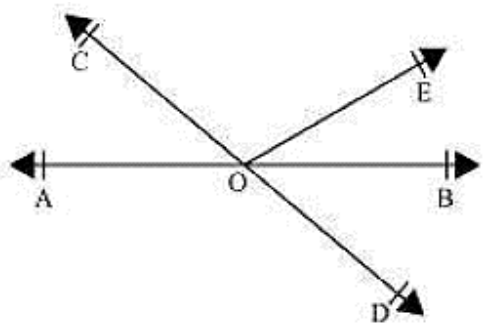
Therefore, plotting the point and on joining them we get the graph AB as a line parallel to y-axis at a distance of on the left of y-axis It is a collection of all points of the plane, having their *x*-coordinate as 4.5.



Exercise(6.1)

Question 1:

In the given figure, lines AB and CD intersect at O. If ∠AOC+∠BOE = 70°and ∠BOD = 40° find ∠BOE and reflex ∠COE.



Solution 1:

AB is a straight line, rays OC and OE stand on it.

$\therefore \angle AOC + \angle COE + \angle BOE = 180°$

$\Rightarrow (\angle AOC + \angle BOE) + \angle COE = 180°$

$\Rightarrow 70° + \angle COE = 180°$

$\Rightarrow \angle COE = 180° - 70° = 110°$

Reflex $\angle COE = 360° - 110° = 250°$

CD is a straight line, rays OE and OB stand on it.

$\therefore \angle COE + \angle BOE + \angle BOD = 180°$

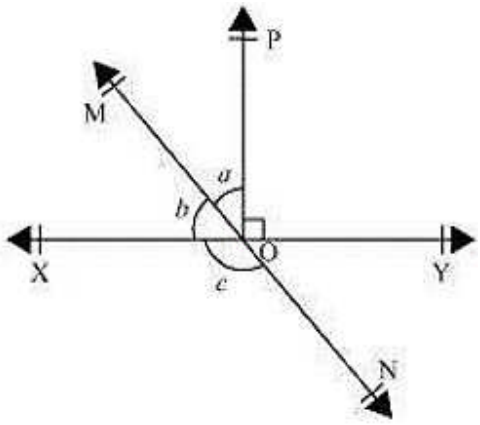
$\Rightarrow 110° + \angle BOE + 40° = 180°$

$\Rightarrow \angle BOE = 180° - 150° = 30°$

Hence, $\angle BOE = 30^0$ and Reflex $\angle COE = 250^0$

Question 2:

In the given figure, lines XY and MN intersect at O. If ∠POY = 90° and a: b = 2:3, find c.



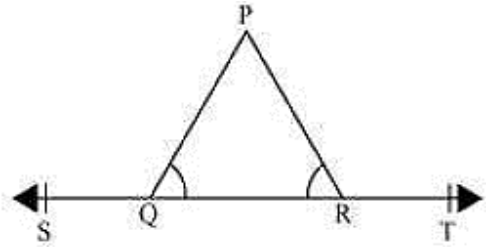
Solution 2:

Let the common ratio between a and b be x.

$\therefore$ a = 2x, and b = 3x

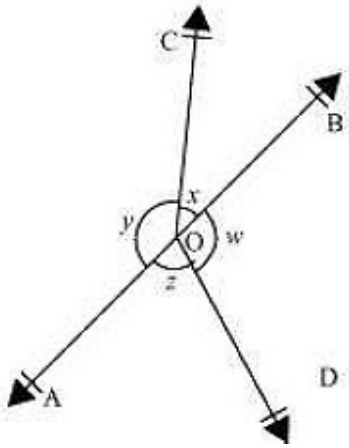
XY is a straight line, rays OM and OP stand on it.
$\therefore \angle XOM + \angle MOP + \angle POY = 180^o$
$b + a + \angle POY = 180^o$
$3x + 2x + 90^o = 180^o$
$5x = 90^o$
$x = 18^o$
$a = 2x = 2 \times 18 = 36^o$
$b = 3x = 3 \times 18 = 54^o$
MN is a straight line. Ray OX stands on it.
$\therefore$ b + c = 180^o (Linear Pair)
$54^o + c = 180^o$
$c = 180^o - 54^o = 126^o$
$\therefore$ c = 126^o

Question 3:
In the given figure, $\angle PQR = \angle PRQ$, then prove that $\angle PQS = \angle PRT$.



Solution 3:
In the given figure, ST is a straight line and ray QP stands on it.
$\therefore \angle PQS + \angle PQR = 180^o$ (Linear Pair)
$\angle PQR = 180^o - \angle PQS$ …(1)
$\angle PRT + \angle PRQ = 180^o$ (Linear Pair)
$\angle PRQ = 180^o - \angle PRT$ …(2)
It is given that $\angle PQR = \angle PRQ$.
Equating Equations (1) and (2), we obtain
$180^o - \angle PQS = 180 - \angle PRT$
$\angle PQS = \angle PRT$ (Proved)

Question 4:
In the given figure, if $x + y = w + z$ then prove that AOB is a line.



Solution 4:

It can be observed that,

$x + y + z + w = 360^o$ (Complete angle)

It is given that,

$x + y = z + w$

$\therefore x + y + x + y = 360^o$

$2(x + y) = 360^o$

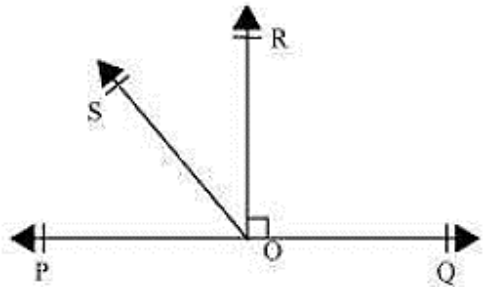
$x + y = 180^o$

Since x and y form a linear pair, therefore, AOB is a line. (Proved)

Question 5:

In the given figure, POQ is a line. Ray OR is perpendicular to line PQ. OS is another ray lying between rays OP and OR. Prove that

$\angle ROS = \frac{1}{2}(\angle QOS - \angle POS)$



Solution 5:

It is given that OR ⊥ PQ

$\angle POR = 90^o$

$\angle POS + \angle SOR = 90^o$

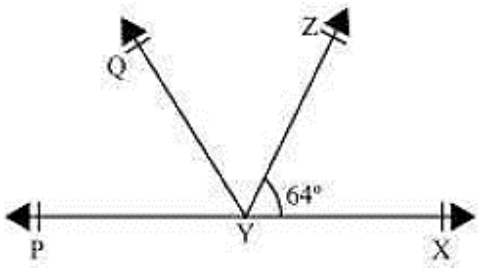
$\angle ROS = 90^o - \angle POS$ …(1)

$\angle QOR = 90^o$ (As OR ⊥PQ)

$\angle QOS - \angle ROS = 90^o$
$\angle ROS = \angle QOS - 90^o$ … (2)
On adding Equations (1) and (2), we obtain
$2\angle ROS = \angle QOS - \angle POS$
$\angle ROS = \frac{1}{2}(\angle QOS - \angle POS)$

Question 6:
It is given that $\angle XYZ = 64^o$ and XY is produced to point P. Draw a figure from the given information. If ray YQ bisects $\angle ZYP$, find $\angle XYQ$ and reflex $\angle QYP$.

Solution 6:

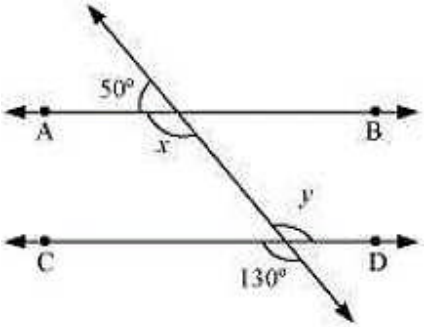


It is given that line YQ bisects $\angle PYZ$.
Hence, $\angle QYP = \angle ZYQ$
It can be observed that PX is a line. Rays YQ and YZ stand on it.
$\angle XYZ + \angle ZYQ + \angle QYP = 180^o$
$64^o + 2\angle QYP = 180^o$
$2\angle QYP = 180^o - 64^o = 116^o$
$\angle QYP = 58^o$
Also, $\angle ZYQ = \angle QYP = 58^o$
Reflex $\angle QYP = 360^o - 58^o = 302^o$
$\angle XYQ = \angle XYZ + \angle ZYQ$
$= 64^o + 58^o = 122^o$
Hence, $\angle XYQ = 122^o$, Reflex $\angle QYP = 302^o$

Exercise (6.2)

Question 1:

In the given figure, find the values of x and y and then show that AB || CD.



Solution 1:

It can be observed that,

$50^\circ + x = 180^\circ$ (Linear pair)

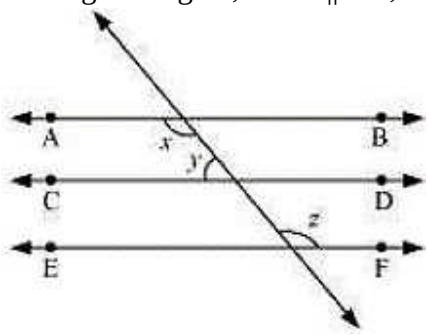
$x = 130^\circ$ …(1)

Also, $y = 130^\circ$ (Vertically opposite angles)

As x and y are alternate interior angles for lines AB and CD and also measures of these angles are equal to each other, therefore, line AB || CD.

Question 2:

In the given figure, if AB || CD, CD || EF and y: z = 3:7, find x.



Solution 2:

It is given that AB || CD and CD || EF

∴ AB || CD || EF (Lines parallel to the same line are parallel to each other)

It can be observed that

x = z (Alternateinteriorangles) … (1)

It is given that y: z = 3:7

Let the common ratio between y and z be a.

∴ y = 3a and z = 7a

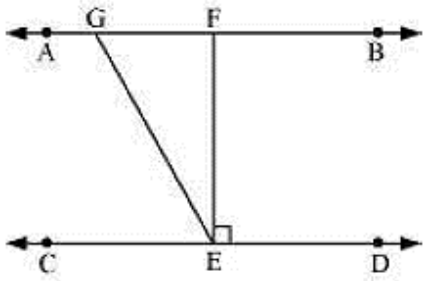
Also, $x + y = 180^\circ$ (Co-interior angles on the same side of the transversal)

$z + y = 180^\circ$ [Using Equation (1)]

$7a + 3a = 180^o$
$10a = 180^o$
$a = 18^o$
$\therefore x = 7a = 7 \times 18^o = 126^o$

Question 3:

In the given figure, If AB || CD, EF ⊥ CD and ∠GED = 126º, find ∠AGE, ∠GEF and ∠FGE.



Solution 3:

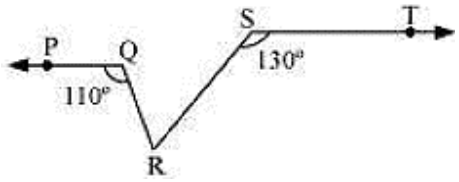
It is given that,
AB || CD and EF ⊥ CD
∠GED = 126º
∠GEF + ∠FED = 126º
∠GEF + 90º = 126º
∠GEF = 36º
As ∠AGE and ∠GED are alternate interior angles.
∠AGE = ∠GED = 126º

However, ∠AGE + ∠FGE = 180º (Linear pair)
126º + ∠FGE = 180º
∠FGE = 180º − 126º = 54º

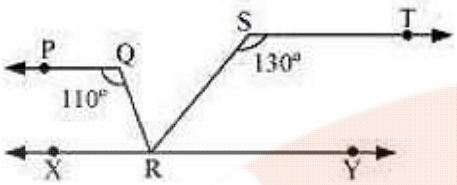
Hence, ∠AGE = 126º, ∠GEF = 36º, ∠FGE = 54º

Question 4:

In the given figure, if PQ || ST, ∠PQR = 110º and ∠RST = 130º, find ∠QRS.
[*Hint*: Draw a line parallel to ST through point R.]



Solution 4:



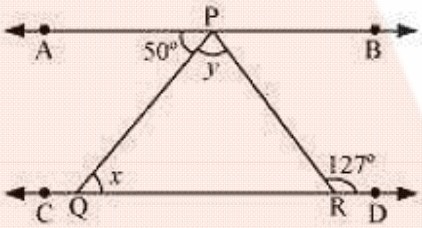
Let us draw a line XY parallel to ST and passing through point R.
∠PQR + ∠QRX = 180° (Co-interior angles on the same side of transversal QR)
110° + ∠QRX = 180°
∠QRX = 70°

Also,
∠RST + ∠SRY = 180° (Co-interior angles on the same side of transversal SR)
130° + ∠SRY = 180°
∠SRY = 50°

XY is a straight line. RQ and RS stand on it.
∠QRX + ∠QRS + ∠SRY = 180°
70° + ∠QRS + 50° = 180°
∠QRS = 180° − 120° = 60°

Question 5:

In the given figure, if AB || CD, ∠APQ = 50° and ∠PRD = 127°, find x and y.

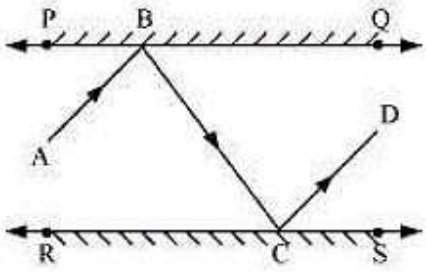


Solution 5:

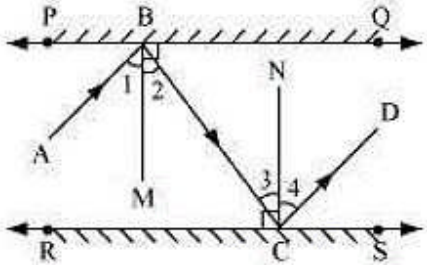
∠APR = ∠PRD (Alternate interior angles)
50° + y = 127°
y = 127° − 50°
y = 77°
Also,
∠APQ = ∠PQR (Alternate interior angles)
50° = x
Therefore, x = 50° and y = 77°

Question 6:

In the given figure, PQ and RS are two mirrors placed parallel to each other. An incident ray AB strikes the mirror PQ at B, the reflected ray moves along the path BC and strikes the mirror RS at C and again reflects back along CD. Prove that AB || CD.



Solution 6:



Let us draw BM ⊥ PQ and CN ⊥ RS.
As PQ || RS,
Therefore, BM || CN
Thus, BM and CN are two parallel lines and a transversal line BC cuts them at B and C respectively.
∠2 = ∠3 (Alternate interior angles)

However, ∠1 = ∠2 and ∠3 = ∠4 (By laws of reflection)
∠1 = ∠2 = ∠3 = ∠4

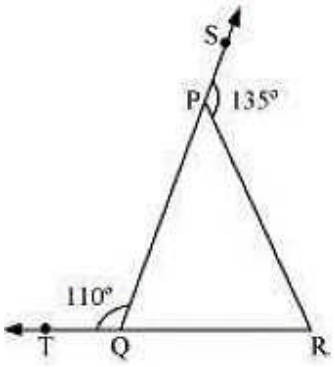
Also,
∠1 + ∠2 = ∠3 + ∠4
∠ABC = ∠DCB

However, these are alternate interior angles.
∴ AB || CD

Exercise (6.3)

Question 1:

In the given figure, sides QP and RQ of Δ PQR are produced to points S and T respectively. If ∠SPR = 135º and ∠PQT = 110º, find ∠PRQ.



Solution 1:

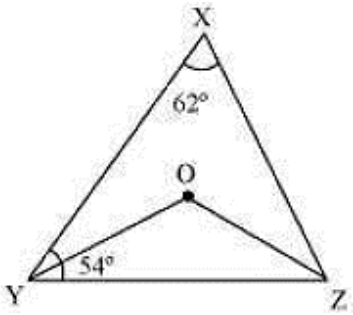
It is given that,
∠SPR = 135º and ∠PQT = 110º
∠SPR + ∠QPR = 180º (Linear pair angles)
135º + ∠QPR = 180º
∠QPR = 45º

Also, ∠PQT + ∠PQR = 180º (Linear pair angles)
110º + ∠PQR = 180º
∠PQR = 70º

As the sum of all interior angles of a triangle is 180º, therefore, for Δ PQR,
∠QPR + ∠PQR + ∠PRQ = 180º
45º + 70º + ∠PRQ = 180º
∠PRQ = 180º − 115º
∠PRQ =65º

Question 2:

In the given figure, ∠X = 62º, ∠XYZ = 54º. If YO and ZO are the bisectors of ∠XYZ and ∠XZY respectively of Δ XYZ, find ∠OZY and ∠YOZ.



Solution 2:

As the sum of all interior angles of a triangle is 180º, therefore, for Δ XYZ,

∠X + ∠XYZ + ∠XZY = 180º

62º + 54º + ∠XZY = 180º

∠XZY = 180º − 116º

∠XZY = 64º

$\angle OZY = \frac{64}{2} = 32^\circ$ (OZ is the angle bisector of ∠XZY)

Similarly, $\angle OYZ = \frac{54}{2} = 27^\circ$

Using angle sum property for Δ OYZ, we obtain

∠OYZ + ∠YOZ + ∠OZY = 180º

27º + ∠YOZ + 32º = 180º

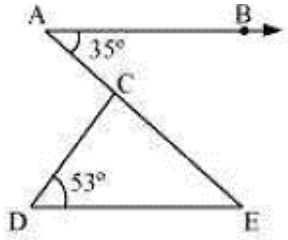
∠YOZ = 180º − 59º

∠YOZ = 121º

Hence, ∠OZY = 32º and ∠YOZ = 121º

Question 3:

In the given figure, if AB || DE, ∠BAC = 35º and ∠CDE = 53º, find ∠DCE.



Solution 3:

AB || DE and AE is a transversal.

∠BAC = ∠CED (Alternate interior angles)

∠CED = 35º

In Δ CDE,

∠CDE + ∠CED + ∠DCE = 180º (Angle sum property of a triangle)

53º + 35º + ∠DCE = 180º

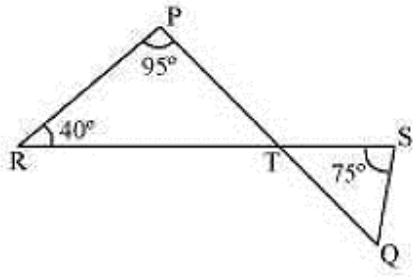
∠DCE = 180º − 88º

∠DCE =92º

Question 4:

In the given figure, if lines PQ and RS intersect at point T, such that ∠PRT = 40º,

∠RPT = 95º and ∠TSQ = 75º, find ∠SQT.



Solution 4:

Using angle sum property for Δ PRT, we obtain

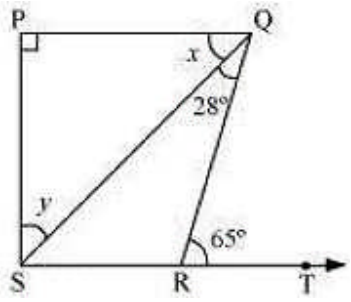
∠PRT + ∠RPT + ∠PTR = 180º
40º + 95º + ∠PTR = 180º
∠PTR = 180º − 135º
∠PTR = 45º
∠STQ = ∠PTR = 45º (Vertically opposite angles)
∠STQ = 45º

By using angle sum property for Δ STQ, we obtain

∠STQ + ∠SQT + ∠QST = 180º
45º + ∠SQT + 75º = 180º
∠SQT = 180º − 120º
∠SQT =60º

Question 5:

In the given figure, if PQ ⊥ PS, PQ || SR, ∠SQR = 28º and ∠QRT = 65º, then find the values of x and y.



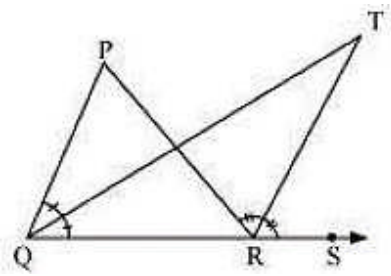
Solution 5:

It is given that PQ || SR and QR is a transversal line.
∠PQR = ∠QRT (Alternate interior angles)
x + 28º = 65º

$x = 65^o - 28^o$
$x = 37^o$
By using the angle sum property for Δ SPQ, we obtain
$\angle SPQ + x + y = 180^o$
$90^o + 37^o + y = 180^o$
$y = 180^o - 127^o$
$y = 53^o$
$x = 37^o$ and $y = 53^o$

Question 6:

In the given figure, the side QR of Δ PQR is produced to a point S. If the bisectors of ∠PQR and ∠PRS meet at point T, then prove that $\angle QTR = \frac{1}{2}\angle QPR$.



Solution 6:

In Δ QTR, ∠TRS is an exterior angle.

$\therefore \angle QTR + \angle TQR = \angle TRS$

$\angle QTR = \angle TRS - \angle TQR$ …(1)

For Δ PQR, ∠PRS is an external angle.

$\therefore \angle QPR + \angle PQR = \angle PRS$

$\angle QPR + 2\angle TQR = 2\angle TRS$ (As QT and RT are angle bisectors)

$\angle QPR = 2(\angle TRS - \angle TQR)$

$\angle QPR = 2\angle QTR$ [By using Equation (1)]

$\angle QTR = \frac{1}{2}\angle QPR$

!

Exercise 2.1

Question 1:

Which of the following expressions are polynomials in one variable and which are not? State reasons for your answer.

(i) $4x^2 - 3x + 7$

(ii) $y^2 + \sqrt{2}$

(iii) $3\sqrt{t} + t\sqrt{2}$

(iv) $y + \frac{2}{y}$

(v) $y + 2y^{-1}$

Solution 1:

i) $4x^2 - 3x + 7$

One variable is involved in given polynomial which is 'x'

Therefore, it is a polynomial in one variable 'x'.

(ii) $y^2 + \sqrt{2}$

One variable is involved in given polynomial which is 'y'

Therefore, it is a polynomial in one variable 'y'.

(iii) $3\sqrt{t} + t\sqrt{2}$

No. It can be observed that the exponent of variable t in term $3\sqrt{t}$ is $\frac{1}{2}$, which is nota whole number. Therefore, this expression is not a polynomial.

(iv) $y + \frac{2}{y}$

$y + 2y^{-1}$

The power of variable 'y' is -1 which is not a whole number.

Therefore, it is not a polynomial in one variable

No. It can be observed that the exponent of variable y in term $\frac{2}{y}$ is -1, which is not a whole number. Therefore, this expression is not a polynomial.

(v) $x^{10} + y^3 + t^{50}$

In the given expression there are 3 variables which are 'x, y, t' involved.

Therefore, it is not a polynomial in one variable.

Question 2:

Write the coefficients of x^2 in each of the following:

(i) $2 + x^2 + x$

(ii) $2 + x^2 + x^3$

(iii) $\frac{\pi}{2} x^2 + x$

(iv) $\sqrt{2}x + 1$

Solution 2:

(i) $2 + x^2 + x^3$

$2 + 1(x^2) + x$

The coefficient of x^2 is 1.

(ii) $2 + x^2 + x^3$

$2 - 1(x^2) + x$

The coefficient of x^2 is -1.

(iii) $\frac{\pi}{2} x^2 + x$

The coefficient x^2 of is $\frac{\pi}{2}$.

(iv) $\sqrt{2}x + 0 + x^2 + \sqrt{2}x + 1$

The coefficient of x^2 is 0.

Question 3:

Give one example each of a binomial of degree 35, and of a monomial of degree 100.

Solution 3 :

Binomial of degree 35 means a polynomial is having

1. Two terms
2. Highest degree is 35

Example: $x^{35} \square x^{34}$

Monomial of degree 100 means a polynomial is having

1. One term
2. Highest degree is 100

Example : x^{100}.

Question 4:

Write the degree of each of the following polynomials:

(i) $5x^3 \square 4x^2 \square 7x$

(ii) $4 \square y^2$

(iii) $5t \square \sqrt{7}$

(iv) 3

Solution 4 :

Degree of a polynomial is the highest power of the variable in the polynomial.

(i) $5x^3 \square\square 4x^2 \quad 7x$

Highest power of variable 'x' is 3. Therefore, the degree of this polynomial is 3

(ii) $4 \square y^2$

Highest power of variable 'y' is 2. Therefore, the degree of this polynomial is 2.

(iii) $5t \square \sqrt{7}$

Highest power of variable 't' is 1. Therefore, the degree of this polynomial is 1.

(iv)3

This is a constant polynomial. Degree of a constant polynomial is always 0.

Question 5: Classify the following as linear, quadratic and cubic polynomial:

(i) $xx^2 \square$

(ii) $xx \square^3$

(iii) $yy \square^2 \square 4$

(iv) $1+x$
(v) 3t
(vi) r^2
(vii) $7x^2$ $7x^3$

Solution 5:
Linear polynomial – whose variable power is '1'

Quadratic polynomial - whose variable highest power is '2'
Cubic polynomial- whose variable highest power is '3'

(i) x^2+x is a quadratic polynomial as its highest degree is 2.
(ii) $x-x^3$ is a cubic polynomial as its highest degree is 3.
(iii) $y+y^2+4$ is a quadratic polynomial as its highest degree is 2.
(iv) 1 + x is a linear polynomial as its degree is 1.
(v) 3t is a linear polynomial as its degree is 1.
(vi) r^2 is a quadratic polynomial as its degree is 2.
(vii) $7x^2$ $7x^3$ is a cubic polynomial as highest its degree is 3.

Exercise 2.2

Question 1:
Find the value of the polynomial at $5x-4x^2+3$ at
(i) x = 0
(ii) x = −1
(iii) x = 2

Solution 1:
(i) $p(x)=5x-4x^2+3$

$p(0)=5(0)-4(0)^2+3=3$

(ii) $p(x)=5x-4x^2+3$

$p(-1)=5(-1)-4(-1)^2+3$
$=-5-4(1)+3=-6$

(iii) $p(x)=5x-4x^2+3$

$p(2)=5(2)-4(2)^2+3=10-16+3=-3$

Question 2:

Find p(0), p(1) and p(2) for each of the following polynomials:

(i) $p(y) = y^2 - y + 1$

(ii) $p(t) = 2 + t + 2t^2 - t3$

(iii) $p(x) = x^3$

(iv) $p(x) = (x - 1)(x + 1)$

Solution 2:

(i)$p(y) = y^2 - y + 1$

- $p(0) = (0)^2 - (0) + 1 = 1$
- $p(1) = (1)^2 - (1) + 1 = 1 - 1 + 1 = 1$
- $p(2) = (2)^2 - (2) + 1 = 4 - 2 + 1 = 3$

(ii)$p(t) = 2 + t + 2t^2 - t^3$

- $p(0) = 2 + 0 + 2(0)^2 - (0)^3 = 2$
- $p(1) = 2 + (1) + 2(1)^2 - (1)^3 = 2 + 1 + 2 - 1 = 4$
- $p(2) = 2 + 2 + 2(2)^2 - (2)^3$

$= 2 + 2 + 8 - 8 = 4$

(iii)$p(x) = x^3$

- $p(0) = (0)^3 = 0$
- $p(1) = (1)^3 = 1$
- $p(2) = (2)^3 = 8$

(v) $p(x) = (x - 1)(x + 1)$

- $p(0) = (0 - 1)(0 + 1) = (-1)(1) = -1$
- $p(1) = (1 - 1)(1 + 1) = 0(2) = 0$
- $p(2) = (2 - 1)(2 + 1) = 1(3) = 3$

Question 3:

Verify whether the following are zeroes of the polynomial, indicated against them.

(i) $p(x)=3x+1, x=-\frac{1}{3}$

(ii) $p(x)=5x-\pi, x=\frac{4}{5}$

(iii) $p(x)=x^2-1, x=1,-1$

(iv) $p(x)=(x+1)(x-2), x=-1,2$

(v) $p(x)=x^2, x=0$

(vi) $p(x)=lm+m, x=-\frac{m}{l}$

(vii) $p(x)=3x^2-1, x=-\frac{1}{\sqrt{3}}, \frac{2}{\sqrt{3}}$

(viii) $p(x)=2x+1, x=\frac{1}{2}$

Solution 3:

(i) If $x=-\frac{1}{3}$ is a zero of given polynomial p(x) = 3x + 1, then $p\left(-\frac{1}{3}\right)$ should be 0.

Here, $p\left(-\frac{1}{3}\right)=3\left(-\frac{1}{3}\right)+1$ = -1+1=0

Therefore, is a zero of the given polynomial.

(ii) If $x=\frac{4}{5}$ is a zero of polynomial p(x) = 5x − π, then $p\left(\frac{4}{5}\right)$ should be 0.

Here, $p\left(\frac{4}{5}\right)=5\left(\frac{4}{5}\right)$ -π = 4 − π

As $p\left(\frac{4}{5}\right) \neq 0$

Therefore, $x=\frac{4}{5}$ is not a zero of the given polynomial.

(iii)If x = 1 and x = −1 are zeroes of polynomial p(x) = $x^2 - 1$, then p(1) and p(−1)should be 0.

Here, $p(1) = (1)^2 - 1 = 0$, and

$p(-1) = (-1)^2 - 1 = 0$

Hence, x = 1 and −1 are zeroes of the given polynomial.

(iv)If x = −1 and x = 2 are zeroes of polynomial p(x) = (x +1) (x − 2), then p (−1) and p(2)should be 0.

Here, $p(-1) = (-1 + 1)(-1 - 2) = 0(-3) = 0$, and

$p(2) = (2 + 1)(2 - 2) = 3(0) = 0$

Therefore, x = −1 and x = 2 are zeroes of the given polynomial.

(v)If x = 0 is a zero of polynomial $p(x) = x^2$, then p(0) should be zero.

Here, $p(0) = (0)^2 = 0$

Hence, x = 0 is a zero of the given polynomial.

(vi)If $p\left(\frac{m}{l}\right)$ is a zero of polynomial p(x) = lx + m, then $p\left(\frac{m}{l}\right)$ should be 0.

Here, $p\left(\frac{m}{l}\right) = l\left(\frac{m}{l}\right) + m = m - m = 0$

Therefore, $x = \frac{m}{l}$ is a zero of the given polynomial.

(vii)If $x = \frac{1}{\sqrt{3}}$ and $x = \frac{2}{\sqrt{3}}$ are zeroes of polynomial $p(x) = 3x^2 - 1$, then

$p\left(\frac{1}{\sqrt{3}}\right)$ and $p\left(\frac{2}{\sqrt{3}}\right)$ should be 0.

Here, $p\left(\frac{1}{\sqrt{3}}\right)=3\left(\frac{1}{\sqrt{3}}\right)^2+1=3\left(\frac{1}{3}\right)+1=1+1=0$, and

$p\left(\frac{2}{\sqrt{3}}\right)=3\left(\frac{2}{\sqrt{3}}\right)^2+1=3\left(\frac{4}{3}\right)+1=4+1=3$

Hence, $x=\frac{1}{\sqrt{3}}$ is a zero of the given polynomial.

However, $x=\frac{2}{\sqrt{3}}$ is not a zero of the given polynomial.

(viii)If $x=\frac{1}{2}$ isa zero of polynomial p(x)= 2x + 1, then $p\left(\frac{1}{2}\right)$ should be 0.

Here, $p\left(\frac{1}{2}\right)=2\left(\frac{1}{2}\right)+1=1+1=2$

As $p\left(\frac{1}{2}\right)\neq 0$,

Therefore, $x=\frac{1}{2}$ isnot a zero of thegiven polynomial.

Question 4:

Find the zero of the polynomial in each of the following cases:

(i)p(x) = x + 5

(ii)p(x) = x – 5

(iii)p(x) = 2x + 5

(iv)p(x) = 3x – 2

(v)p(x) = 3x

(vi)p(x) = ax, $a \neq 0$

(vii)p(x) = cx + d, $c \neq 0$, c, d are real numbers.

Solution 4:

Zero of a polynomial is that value of the variable at which the value of thepolynomial is obtained as 0.

(i) p(x) = x + 5

Let p(x) = 0

x + 5 = 0

x = − 5

Therefore, for x = −5, the value of the polynomial is 0 and hence, x = −5 is a zero of the given polynomial.

(ii)p(x) = x − 5

Let p(x) = 0

x − 5 = 0

x = 5

Therefore, for x = 5, the value of the polynomial is 0 and hence, x = 5 is a zero of the given polynomial.

(iii)p(x) = 2x + 5

Let p(x) = 0

2x + 5 = 0

2x = − 5

$x = -\frac{5}{2}$

Therefore, for $x = -\frac{5}{2}$, thevalue of thepolynomial is0 and hence, $x = -\frac{5}{2}$ is a zero of the given polynomial.

(iv)p(x) = 3x − 2

p(x) = 0

3x − 2 = 0

Therefore, for $x = \frac{2}{3}$, thevalue of thepolynomial is0 and hence, $x = \frac{2}{3}$ isa zero of thegiven polynomial.

(v)p(x) = 3x
Let p(x) = 0
3x = 0
x = 0
Therefore, for x = 0, the value of the polynomial is 0 and hence, x = 0 is a zero of the given polynomial.

(vi)p(x) = ax
Let p(x) = 0
ax = 0
x = 0
Therefore, for x = 0, the value of the polynomial is 0 and hence, x = 0 is a zero of the given polynomial.

(vii)p(x) = cx + d
Let p(x) = 0
cx + d = 0

$x = \frac{-d}{c}$

Therefore,for $x = \frac{-d}{c}$, the value of the polynomial is 0 and hence, $x = \frac{-d}{c}$ is a zero of the given polynomial.

Exercise 2.3

Question 1:

Find the remainder when $x^3 + 3x^2 + 3x + 1$ is divided by

(i)$x + 1$

(ii) $x - \frac{1}{2}$

(iii)x

(iv)$x + \pi$

(v)$5 + 2x$

Solution 1:

(i) $x^3 + 3x^2 + 3x + 1 \div x + 1$

By long division, we get

$$
\begin{array}{r}
x^2+2x+1 \\
x+1\overline{)\,x^3+3x^2+3x+1} \\
x^3+x^2 \\
\hline
2x^2+3x+1 \\
2x^2+2x \\
\hline
x+1 \\
x+1 \\
\hline
0
\end{array}
$$

Therefore, the remainder is 0.

(ii)$x^3 + 3x^2 + 3x + 1 \div x - \frac{1}{2}$

By long division,

$$
\begin{array}{r|l}
 & x^2+\frac{7}{2}x+\frac{19}{4} \\
\hline
x-\frac{1}{2} & x^3+3x^2+3x+1 \\
 & x^3-\frac{x^2}{2} \\
 & -\quad + \\
\hline
 & \frac{7}{2}x^2+3x+1 \\
 & \frac{7}{2}x^2-\frac{7}{4}x \\
 & -\quad + \\
\hline
 & \frac{19}{4}x+1 \\
 & \frac{19}{4}x-\frac{19}{8} \\
 & -\quad + \\
\hline
 & \frac{27}{8} \\
\hline
\end{array}
$$

Therefore, the remainder is $\frac{27}{8}$.

(iii) $x^3 + 3x^2 + 3x + 1 \div x$

By long division,

$$
\begin{array}{r|l}
 & x^2+3x+3 \\
\hline
x & x^3+3x^2+3x+1 \\
 & x^3 \\
 & - \\
\hline
 & 3x^2+3x+1 \\
 & 3x^2 \\
 & - \\
\hline
 & 3x+1 \\
 & 3x \\
 & - \\
\hline
 & 1 \\
\hline
\end{array}
$$

Therefore, the remainder is 1.

(iv) $x^3 + 3x^2 + 3x + 1 \div x + \pi$
By long division, we get

$$
\begin{array}{l}
\quad\quad x^2+(3-\pi)x+\left(3-3\pi+\pi^2\right) \\
x+\pi\,\overline{)\;x^3+3x^2+3x+1} \\
\quad\quad x^3+\pi x^2 \\
\quad\quad -\quad -\\
\hline
\quad\quad (3-\pi)x^2+3x+1 \\
\quad\quad (3-\pi)x^2+(3-\pi)\pi x \\
\quad\quad -\quad\quad -\\
\hline
\quad\quad \left[3-3\pi+\pi^2\right]x+1 \\
\quad\quad \left[3-3\pi+\pi^2\right]x+\left(3-3\pi+\pi^2\right)\pi \\
\quad\quad -\quad\quad\quad -\\
\hline
\quad\quad\quad\quad \left[1-3\pi+3\pi^2-\pi^3\right] \\
\hline
\end{array}
$$

Therefore, the remainder is □□□□3 ² □□ 1.

(v)5 + 2x
By long division, we get

$$\frac{x^2}{2}+\frac{x}{4}+\frac{7}{8}$$

$$2x+5\,\big)\,\overline{x^3+3x^2+3x+1}$$

$$x^3+\frac{5}{2}x^2$$

$$-\quad -$$

$$\frac{x^2}{2}+3x+1$$

$$\frac{x^2}{2}+\frac{5x}{4}$$

$$-\quad -$$

$$\frac{7x}{4}+1$$

$$\frac{7}{4}x+\frac{35}{8}$$

$$-\quad -$$

$$-\frac{27}{8}$$

Therefore, the remainder is $-\frac{27}{8}$.

Question 2:

Find the remainder when $x^3 - ax^2 + 6x - a$ is divided by $x - a$.

Solution 2:

$x^3 - ax^2 + 6x - a \div x - a$

By long division,

$$x^2+6$$

$$x-a\,\big)\,\overline{x^3-ax^2+6x-a}$$

$$x^3-ax^2$$

$$-\quad +$$

$$6x-a$$

$$6x-6a$$

$$-\quad +$$

$$5a$$

Therefore, when $x^3 - ax^2 + 6x - a$ is divided by $x - a$, the remainder obtained is $5a$.

Question 3:

Check whether $7 + 3x$ is a factor of $3x^3 + 7x$.

Solution 3:

Let us divide $(3x^3 + 7x)$ by $(7 + 3x)$.

By long division, we get

$$
\begin{array}{r}
x^2 - \frac{7}{3}x + \frac{70}{9} \\
3x+7 \overline{\big)\ 3x^3 + 0x^2 + 7x} \\
3x^3 + 7x^2 \\
- \quad - \\
\hline
-7x^2 + 7x \\
-7x^2 - \frac{49x}{3} \\
+ \quad + \\
\hline
\frac{70x}{3} \\
\frac{70x}{3} + \frac{490}{9} \\
- \quad - \\
\hline
-\frac{490}{9} \\
\hline
\end{array}
$$

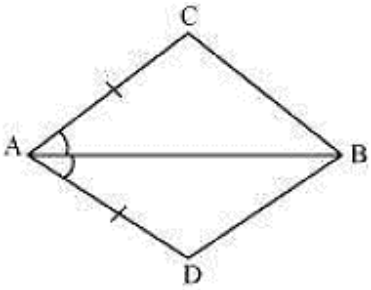
The remainder is not zero,

Therefore, $7 + 3x$ is not a factor of $3x^3 + 7x$.

Exercise(7.1)

Question 1:

In quadrilateral ACBD, AC = AD and AB bisects ∠A (See the given figure). Show that ΔABC ≅ ΔABD. What can you say about BC and BD?

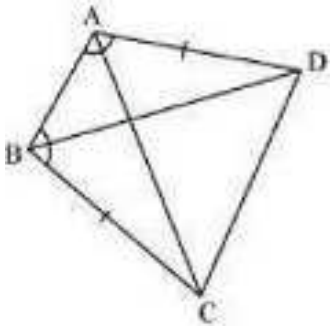


Solution 1:

In ΔABC and ΔABD,
AC = AD (Given)
∠CAB = ∠DAB (AB bisects ∠A)
AB = AB (Common)
∴ ΔABC ≅ ΔABD (By SAS congruence rule)
∴ BC = BD (By CPCT)
Therefore, BC and BD are of equal lengths.

Question 2:

ABCD is a quadrilateral in which AD = BC and ∠DAB = ∠CBA (See the given figure). Prove that
(i) ΔABD ≅ΔBAC
(ii) BD =AC
(iii) ∠ABD =∠BAC.

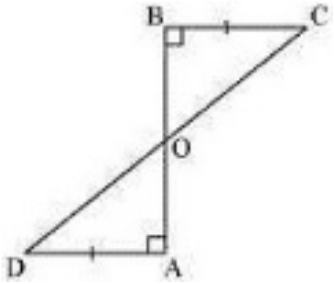


Solution 2:

In ΔABD and ΔBAC,
AD = BC (Given)
∠DAB = ∠CBA (Given)
AB = BA (Common)
∴ ΔABD ≅ ΔBAC (By SAS congruence rule)

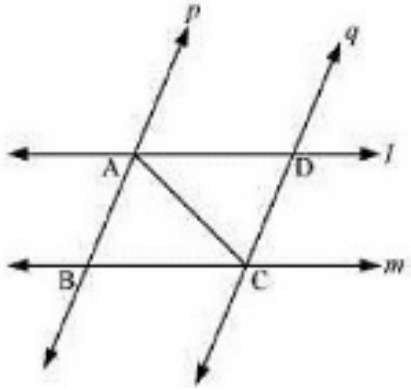
∴ BD = AC (By CPCT)
And, ∠ABD = ∠BAC (By CPCT)

Question 3:
AD and BC are equal perpendiculars to a line segment AB (See the given figure). Show that CD bisects AB.



Solution3:
In ΔBOC and ΔAOD,
∠BOC = ∠AOD (Vertically opposite angles)
∠CBO = ∠DAO (Each 90º)
BC = AD (Given)
∴ ΔBOC ≅ ΔAOD (AAS congruence rule)
∴ BO = AO (By CPCT)
⇒ CD bisects AB.

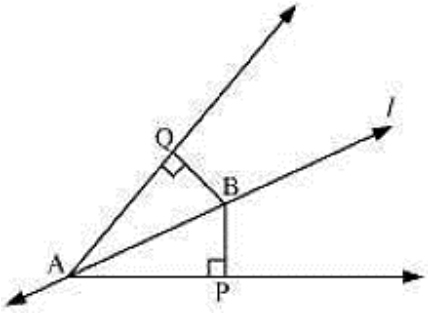
Question 4:
l and m are two parallel lines intersected by another pair of parallel lines p and q (see the given figure). Show that ΔABC ≅ ΔCDA.



Solution 4:
In ΔABC and ΔCDA,
∠BAC = ∠DCA (Alternate interior angles, as $p \parallel q$)

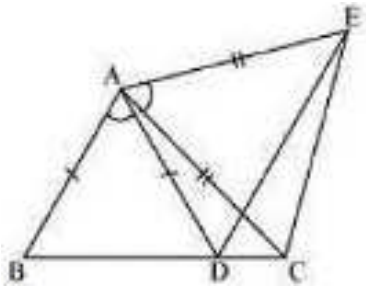
AC = CA (Common)
∠BCA = ∠DAC (Alternate interior angles, as $l \parallel m$)
∴ ΔABC ≅ ΔCDA (By ASA congruence rule)

Question 5:
Line l is the bisector of an angle ∠A and B is any point on l. BP and BQ are perpendiculars from B to the arms of ∠A (see the given figure). Show that:
(i) ΔAPB ≅ΔAQB
(ii) BP = BQ or B is equidistant from the arms of∠A.



Solution 5:
In ΔAPB and ΔAQB,
∠APB = ∠AQB (Each 90º)
∠PAB = ∠QAB (l is the angle bisector of ∠A)
AB = AB (Common)
∴ ΔAPB ≅ ΔAQB (By AAS congruence rule)
∴ BP = BQ (By CPCT)
Or, it can be said that B is equidistant from the arms of ∠A.

Question 6:
In the given figure, AC = AE, AB = AD and ∠BAD = ∠EAC. Show that BC = DE.



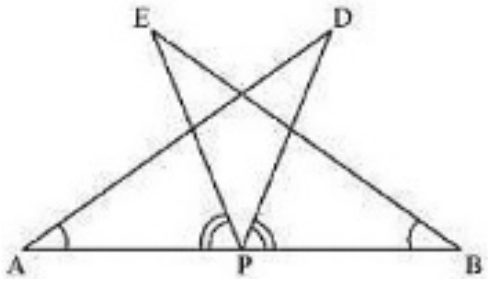
Solution 6:
It is given that ∠BAD = ∠EAC
∠BAD + ∠DAC = ∠EAC + ∠DAC

∠BAC = ∠DAE

In ΔBAC and ΔDAE,
AB = AD(Given)
∠BAC = ∠DAE (Proved above)
AC = AE(Given)

∴ ΔBAC ≅ ΔDAE (By SAS congruence rule)
∴ BC = DE (By CPCT)

Question 7:
AB is a line segment and P is its mid-point. D and E are points on the same side of AB such that ∠BAD = ∠ABE and ∠EPA = ∠DPB (See the given figure). Show that
(i) ΔDAP ≅ΔEBP
(ii) AD =BE

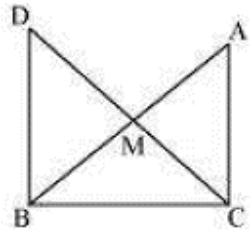


Solution 7:
It is given that ∠EPA = ∠DPB
∠EPA + ∠DPE = ∠DPB + ∠DPE
∴ ∠DPA = ∠EPB
In ΔDAP and ΔEBP,
∠DAP = ∠EBP (Given)
AP = BP (P is mid-point of AB)
∠DPA = ∠EPB (From above)
∴ ΔDAP ≅ ΔEBP (ASA congruence rule)
∴ AD = BE (By CPCT)

Question 8:
In right triangle ABC, right angled at C, M is the mid-point of hypotenuse AB. C is joined to M and produced to a point D such that DM = CM. Point D is joined to point B (see the given figure). Show that:
(i) ΔAMC ≅ΔBMD
(ii) ∠DBC is a rightangle.

(iii) $\Delta DBC \cong \Delta ACB$

(iv) $CM = \frac{1}{2}AB$



Solution 8:

(i) In ΔAMC and ΔBMD,

$AM = BM$ (M is the mid-point of AB)

$\angle AMC = \angle BMD$ (Vertically opposite angles)

$CM = DM$ (Given)

$\therefore \Delta AMC \cong \Delta BMD$ (By SAS congruence rule)

$\therefore AC = BD$ (By CPCT)

And, $\angle ACM = \angle BDM$ (By CPCT)

(ii) $\angle ACM = \angle BDM$

However, $\angle ACM$ and $\angle BDM$ are alternate interior angles.

Since alternate angles are equal,

It can be said that DB || AC

$\angle DBC + \angle ACB = 180^o$ (Co-interior angles)

$\angle DBC + 90^o = 180^o$

$\therefore \angle DBC = 90^o$

(iii) In ΔDBC and ΔACB,

$DB = AC$ (Alreadyproved)

$\angle DBC = \angle ACB$ (Each 90)

$BC = CB$ (Common)

$\therefore \Delta DBC \cong \Delta ACB$ (SAS congruence rule)

(iv) $\Delta DBC \cong \Delta ACB$

$AB = DC$ (By CPCT)

$AB = 2CM$

$\therefore CM = \frac{1}{2}AB$

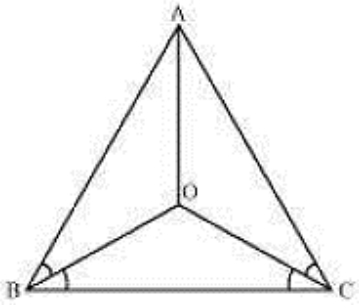
Exercise (7.2)

Question 1:

In an isosceles triangle ABC, with AB = AC, the bisectors of ∠B and ∠C intersect each other at O. Join A to O. Show that:

(i) OB = OC (ii) AO bisects ∠A

Solution 1:



(i) It is given that in triangle ABC, AB =AC

∠ACB = ∠ABC (Angles opposite to equal sides of a triangle are equal)

$\frac{1}{2}$∠ACB = $\frac{1}{2}$∠ABC

∠OCB = ∠OBC

∴ OB = OC (Sides opposite to equal angles of a triangle are also equal)

(ii) In ΔOAB andΔOAC,

AO =AO(Common)

AB = AC (Given)

OB = OC (Proved above)

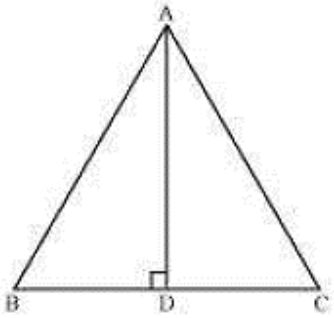
Therefore, ΔOAB ≅ ΔOAC (By SSS congruence rule)

∠BAO = ∠CAO (CPCT)

∴ AO bisects ∠A.

Question 2:

In ΔABC, AD is the perpendicular bisector of BC (see the given figure). Show that ΔABC is an isosceles triangle in which AB = AC.



Solution 2:

In ΔADC and ΔADB,

AD = AD (Common)

∠ADC =∠ADB (Each 90º)

CD = BD (AD is the perpendicular bisector of BC)

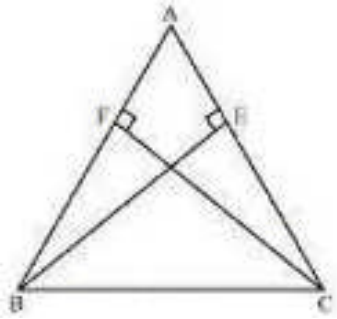
∴ ΔADC ≅ ΔADB (By SAS congruence rule)

∴ AB = AC (By CPCT)

Therefore, ABC is an isosceles triangle in which AB = AC.

Question 3:

ABC is an isosceles triangle in which altitudes BE and CF are drawn to equal sides AC and AB respectively (see the given figure). Show that these altitudes are equal.



Solution 3:

In ΔAEB and ΔAFC,

∠AEB and ∠AFC (Each 90º)

∠A = ∠A (Common angle)

AB = AC (Given)

∴ ΔAEB ≅ ΔAFC (By AAS congruence rule)

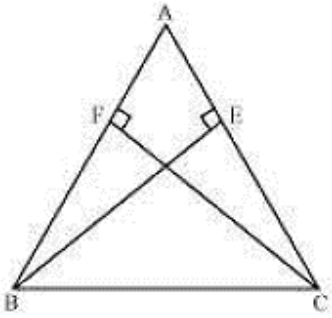
∴ BE = CF (By CPCT)

Question 4:

ABC is a triangle in which altitudes BE and CF to sides AC and AB are equal (see the given figure). Show that

(i) ΔABE ≅ΔACF

(ii) AB = AC, i.e., ABC is an isoscelestriangle.



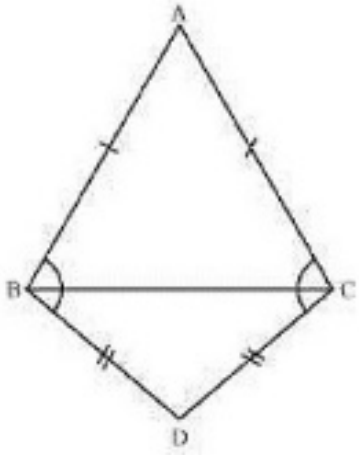
Solution 4:

(i) In ΔABE andΔACF,
∠ABE and ∠ACF (Each 90º)
∠A = ∠A (Common angle)
BE = CF (Given)
∴ ΔABE ≅ ΔACF (By AAS congruence rule)

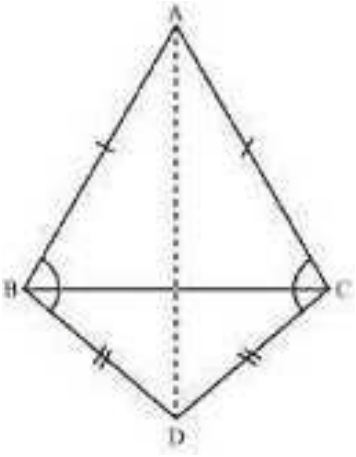
(ii) It has already been provedthat
ΔABE ≅ ΔACF
∴ AB = AC (By CPCT)

Question 5:

ABC and DBC are two isosceles triangles on the same base BC (see the given figure). Show that ∠ABD = ∠ACD.



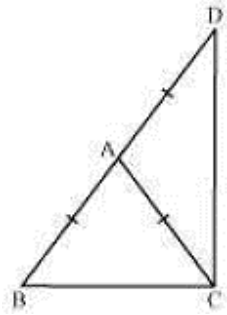
Solution 5:



Let us join AD.
In ΔABD andΔACD,
AB = AC (Given)
BD = CD(Given)
AD = AD (Common side)
∴ ΔABD ≅ ΔACD (By SSS congruence rule)
∴ ∠ABD = ∠ACD (By CPCT)

Question 6:

ΔABC is an isosceles triangle in which AB = AC. Side BA is produced to D such that AD = AB (see the given figure). Show that ∠BCD is a right angle.



Solution 6:

In ΔABC,
AB = AC (Given)
∴ ∠ACB = ∠ABC (Angles opposite to equal sides of a triangle are also equal)

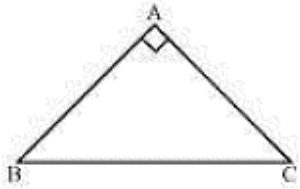
In ΔACD,
AC =AD
∴ ∠ADC = ∠ACD (Angles opposite to equal sides of a triangle are alsoequal)

InΔBCD,

∠ABC + ∠BCD + ∠ADC = 180º (Angle sum property of a triangle)
∠ACB + ∠ACB +∠ACD + ∠ACD = 180º
2(∠ACB + ∠ACD) = 180º
2(∠BCD) = 180º
∴ ∠BCD = 90º

Question 7:
ABC is a right angled triangle in which ∠A = 90º and AB = AC. Find ∠B and ∠C.

Solution 7:

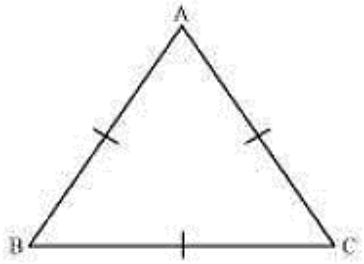


It is given that
AB = AC
∴ ∠C = ∠B (Angles opposite to equal sides are also equal)

In ΔABC,
∠A + ∠B + ∠C = 180º (Angle sum property of atriangle)
90º + ∠B + ∠C =180º
90º + ∠B + ∠B =180º
2∠B = 90º
∠B = 45º
∴ ∠B = ∠C = 45º

Question 8:
Show that the angles of an equilateral triangle are 60º each.

Solution 8 :



Let us consider that ABC is an equilateral triangle.

Therefore, AB = BC = AC
AB = AC
∴ ∠C = ∠B (Angles opposite to equal sides of a triangle are equal)

Also,
AC = BC
∴ ∠B = ∠A (Angles opposite to equal sides of a triangle are equal)

Therefore, we obtain
∠A = ∠B = ∠C

In ΔABC,
∠A + ∠B + ∠C = 180°
∠A + ∠A + ∠A = 180°
3∠A = 180°
∠A = 60°
∴ ∠A = ∠B = ∠C = 60°

Hence, in an equilateral triangle, all interior angles are of measure 60º.

Exercise (7.3)

Question 1:

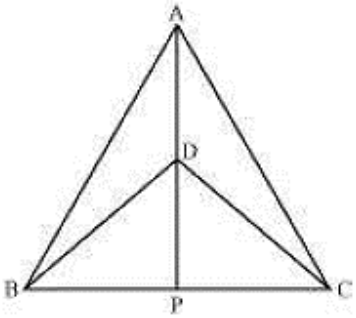
ΔABC and ΔDBC are two isosceles triangles on the same base BC and vertices A and D are on the same side of BC (see the given figure). If AD is extended to intersect BC at P, show that

(i) ΔABD ≅ΔACD

(ii) ΔABP ≅ΔACP

(iii) AP bisects ∠A as well as ∠D.

(iv) AP is the perpendicular bisector ofBC.



Solution 1:

(i) In ΔABD andΔACD,

AB = AC(Given)

BD = CD (Given)

AD = AD (Common)

ΔABD ≅ ΔACD (By SSS congruence rule)

∠BAD = ∠CAD (By CPCT)

∠BAP=∠CAP ….(1)

(ii) In ΔABP and ΔACP,

AB = AC(Given)

∠BAP = ∠CAP [From equation (1)]

AP = AP (Common)

∴ ΔABP ≅ ΔACP (By SAS congruence rule)

∴ BP = CP(ByCPCT) …(2)

(iii) From Equation(1),

$\angle BAP = \angle CAP$

Hence, AP bisects $\angle A$.

In ΔBDP and ΔCDP,

BD = CD (Given)

DP = DP (Common)

BP = CP [From equation (2)]

$\therefore \Delta BDP \cong \Delta CDP$ (By SSS Congruence rule)

$\therefore \angle BDP = \angle CDP$(ByCPCT) …(3)

Hence, AP bisects $\angle D$.

(iv) $\Delta BDP \cong \Delta CDP$

$\therefore \angle BPD = \angle CPD$(ByCPCT) ….(4)

$\angle BPD + \angle CPD = 180^o$ (Linear pair angles)

$\angle BPD + \angle BPD = 180^o$

$2\angle BPD = 180^o$ [From Equation (4)]

$\angle BPD = 90^o$ …(5)

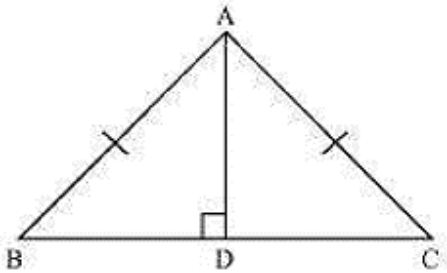
From Equations (2) and (5), it can be said that AP is the perpendicular bisector of BC.

Question 2:

AD is an altitude of an isosceles triangles ABC in which AB = AC. Show that

(i) AD bisects BC (ii) AD bisects$\angle A$.

Solution 2:



(i) In ΔBAD and ΔCAD,

∠ADB = ∠ADC (Each 90° as AD is an altitude)

AB = AC (Given)

AD = AD (Common)

∴ ΔBAD ≅ ΔCAD (By RHS Congruence rule)

∴ BD = CD (By CPCT)

Hence, AD bisects BC.

(ii) Also, byCPCT,

∠BAD = ∠CAD

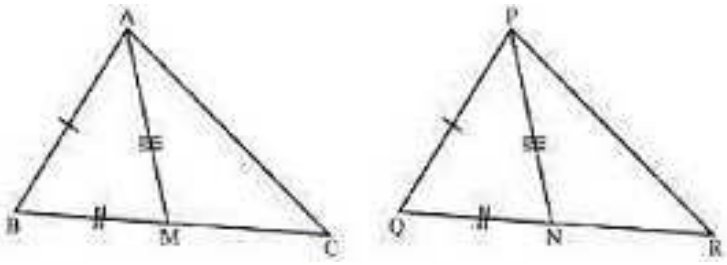
Hence, AD bisects ∠A.

Question 3:

Two sides AB and BC and median AM of one triangle ABC are respectively equal to sides PQ and QR and median PN of ΔPQR (see the given figure). Show that:

(i) ΔABM ≅ΔPQN

(ii) ΔABC ≅ΔPQR



Solution 3:

(i) In ΔABC, AM is the median toBC.

∴ BM = $\frac{1}{2}$BC

In ΔPQR, PN is the median to QR.

$\therefore QN = \frac{1}{2}QR$

However, BC = QR

$\therefore \frac{1}{2}BC = \frac{1}{2}QR$

$\therefore BM = QN$ …(1)

In ΔABM and ΔPQN,

AB = PQ (Given)

BM = QN [From Equation (1)]

AM = PN (Given)

$\Delta ABM \cong \Delta PQN$ (By SSS congruence rule)

$\angle ABM = \angle PQN$ (ByCPCT)

$\angle ABC = \angle PQR$ …(2)

(ii) In ΔABC and ΔPQR,

AB = PQ(Given)

$\angle ABC = \angle PQR$ [From Equation (2)]

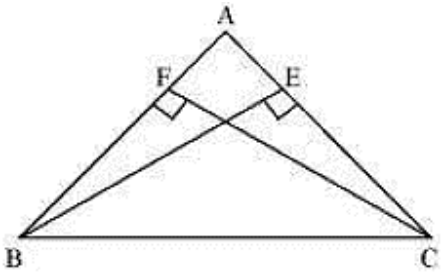
BC = QR (Given)

$\therefore \Delta ABC \cong \Delta PQR$ (By SAS congruence rule)

Question 4:

BE and CF are two equal altitudes of a triangle ABC. Using RHS congruence rule, prove that the triangle ABC is isosceles.

Solution 4:



In ΔBEC and ΔCFB,

∠BEC = ∠CFB (Each 90°)

BC = CB (Common)

BE = CF (Given)

∴ ΔBEC ≅ ΔCFB (By RHS congruency)

∴ ∠BCE = ∠CBF (By CPCT)

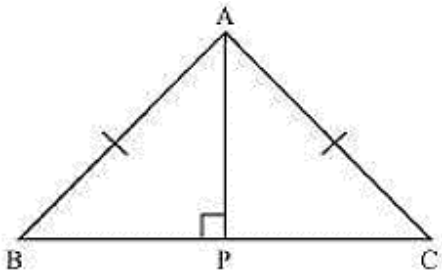
∴ AB = AC (Sides opposite to equal angles of a triangle are equal)

Hence, ΔABC is isosceles.

Question 5:

ABC is an isosceles triangle with AB = AC. Draw AP ⊥ BC to show that ∠B = ∠C.

Solution 5:



In ΔAPB and ΔAPC,

∠APB = ∠APC (Each 90º)

AB =AC (Given)

AP = AP (Common)

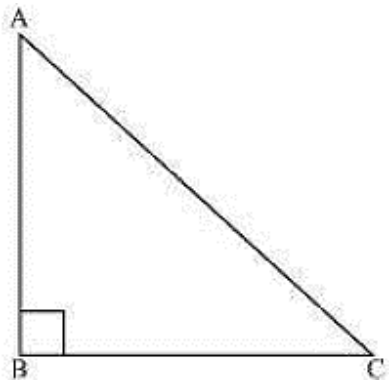
∴ ΔAPB ≅ ΔAPC (Using RHS congruence rule)

∴ ∠B = ∠C (By using CPCT)

Exercise (7.4)

Question 1:
Show that in a right angled triangle, the hypotenuse is the longest side.

Solution 1:



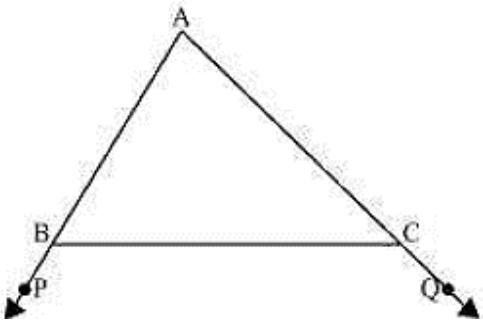
Let us consider a right-angled triangle ABC, right-angled at B.

In ΔABC,
∠A + ∠B + ∠C = 180° (Angle sum property of a triangle)
∠A + 90º + ∠C = 180°
∠A + ∠C = 90°

Hence, the other two angles have to be acute (i.e., less than 90º).
∠B is the largest angle in ΔABC.
∠B >∠A and ∠B >∠C
AC > BC and AC > AB

[In any triangle, the side opposite to the larger (greater) angle is longer.]
Therefore, AC is the largest side in ΔABC.
However, AC is the hypotenuse of ΔABC. Therefore, hypotenuse is the longest side in a right-angled triangle.

Question 2:
In the given figure sides AB and AC of ΔABC are extended to points P and Q respectively. Also, ∠PBC <∠QCB. Show that AC > AB.



Solution 2:

In the given figure,

∠ABC + ∠PBC = 180° (Linear pair)
∠ABC = 180°−∠PBC ...(1)

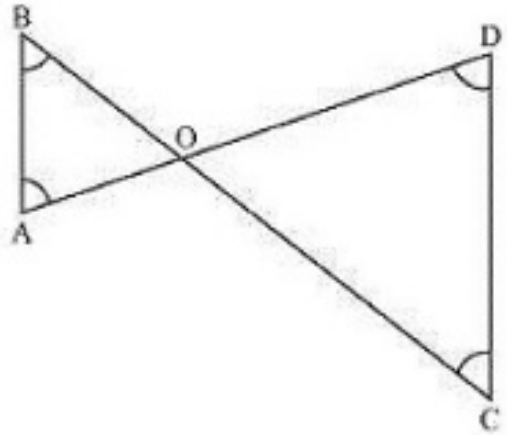
Also,
∠ACB + ∠QCB = 180°
∠ACB = 180°−∠QCB …(2)

As ∠PBC <∠QCB,
180º − ∠PBC > 180º − ∠QCB
∠ABC >∠ACB [From Equations (1) and (2)]
AC > AB (Side opposite to the larger angle is larger.)

Hence proved, AC > AB

Question 3:

In the given figure, ∠B <∠A and ∠C <∠D. Show that AD < BC.



Solution 3:

In ΔAOB,

∠B <∠A

AO < BO (Side opposite to smaller angleissmaller) ...(1)

In ΔCOD,

∠C <∠D

OD < OC (Side opposite to smaller angleissmaller) ...(2)

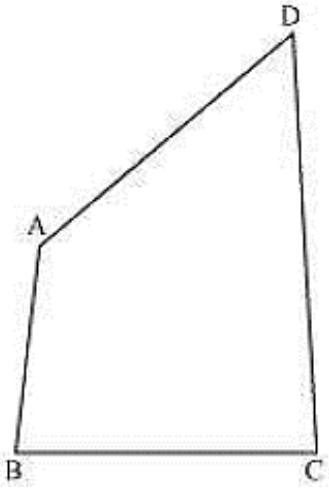
On adding Equations (1) and (2), we obtain

AO + OD < BO + OC

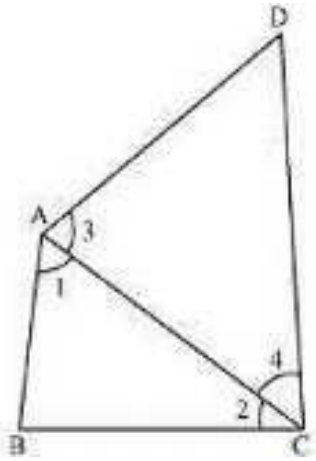
AD < BC , proved

Question 4:

AB and CD are respectively the smallest and longest sides of a quadrilateral ABCD (see the given figure). Show that ∠A >∠C and ∠B >∠D.



Solution 4:



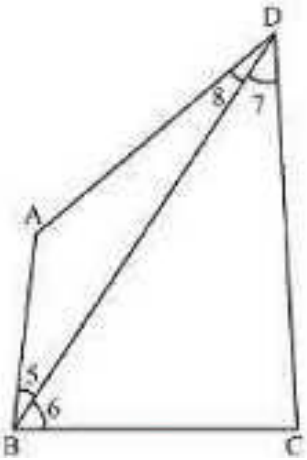
Let us join AC.

In ΔABC,
AB < BC (AB is the smallest side of quadrilateral ABCD)
∠2 <∠1 (Angle opposite to the smaller sideissmaller) ...(1)

In ΔADC,
AD < CD (CD is the largest side of quadrilateral ABCD)
∠4 <∠3 (Angle opposite to the smaller sideissmaller) ...(2)

On adding Equations (1) and (2), we obtain
∠2 + ∠4 <∠1 + ∠3
∠C <∠A
∠A >∠C

Let us join BD.



In ΔABD,
AB < AD (AB is the smallest side of quadrilateral ABCD)

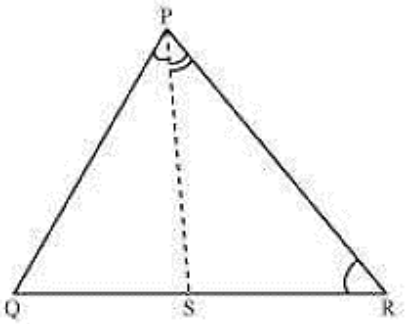
∠8 <∠5 (Angle opposite to the smaller sideissmaller) ...(3)

In ΔBDC,
BC < CD (CD is the largest side of quadrilateral ABCD)
∠7 <∠6 (Angle opposite to the smaller sideissmaller) ...(4)

On adding Equations (3) and (4), we obtain
∠8 + ∠7 <∠5 + ∠6
∠D <∠B
∠B >∠D (Hence, proved)

Question 5:

In the given figure, PR > PQ and PS bisects ∠QPR. Prove that ∠PSR >∠PSQ.



Solution 5:

As PR > PQ,
∠PQR >∠PRQ (Angle opposite to larger sideislarger) ... (1)
PS is the bisector of∠QPR.
∠QPS=∠RPS ...(2)

∠PSR is the exterior angle of ΔPQS.
∠PSR = ∠PQR+∠QPS ...(3)

∠PSQ is the exterior angle of ΔPRS.
∠PSQ = ∠PRQ+ ∠RPS ...(4)

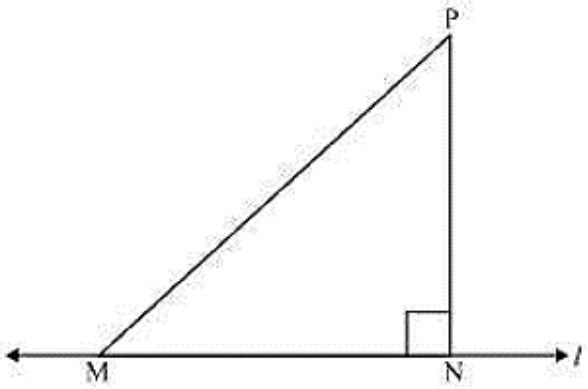
Adding Equations (1) and (2), we obtain
∠PQR + ∠QPS >∠PRQ + ∠RPS

∠PSR >∠PSQ [Using the values of Equations (3) and (4)]

Question 6:

Show that of all line segments drawn from a given point not on it, the perpendicular line segment is the shortest.

Solution 6:



Let us take a line *l* and from point *P* (i.e., not on line *l*), draw two line segments PN and PM. Let PN be perpendicular to line *l* and PM is drawn at some other angle.

In ΔPNM,
∠N = 90º
∠P + ∠N + ∠M = 180º (Angle sum property of a triangle)
∠P + ∠M = 90º

Clearly, ∠M is an acute angle.
∠M <∠N
PN < PM (Side opposite to the smaller angle is smaller)

Similarly, by drawing different line segments from P to l, it can be proved that PN is smaller in comparison to them.
Therefore, it can be observed that of all line segments drawn from a given point not on it, the perpendicular line segment is the shortest.

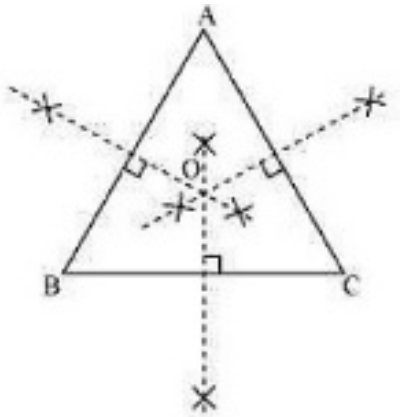
Exercise (7.5)

Question 1:

ABC is a triangle. Locate a point in the interior of ΔABC which is equidistant from all the vertices of ΔABC.

Solution 1:

Circumcentre of a triangle is always equidistant from all the vertices of that triangle. Circumcentre is the point where perpendicular bisectors of all the sides of the triangle meet together.



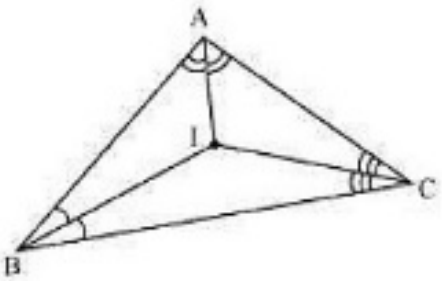
In ΔABC, we can find the circumcentre by drawing the perpendicular bisectors of sides AB, BC, and CA of this triangle. O is the point where these bisectors are meeting together. Therefore, O is the point which is equidistant from all the vertices of ΔABC.

Question 2:

In a triangle locate a point in its interior which is equidistant from all the sides of the triangle.

Solution 2:

The point which is equidistant from all the sides of a triangle is called the incentre of the triangle. Incentre of a triangle is the intersection point of the angle bisectors of the interior angles of that triangle.



Here, in ΔABC, we can find the incentre of this triangle by drawing the angle bisectors of the interior angles of this triangle. I is the point where these angle bisectors are intersecting each other. Therefore, I is the point equidistant from all the sides of ΔABC.

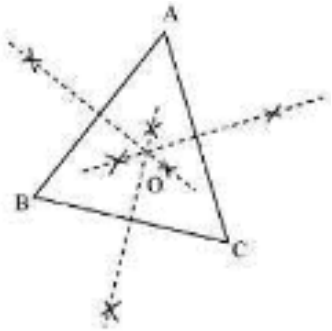
Question 3:

In a huge park people are concentrated at three points (see the given figure)

A: where there are different slides and swings for children,
B: near which a man-made lake is situated,
C: which is near to a large parking and exit.
Where should an ice-cream parlour be set up so that maximum number of persons can approach it?
(*Hint*: The parlor should be equidistant from A, B and C)

Solution 3:

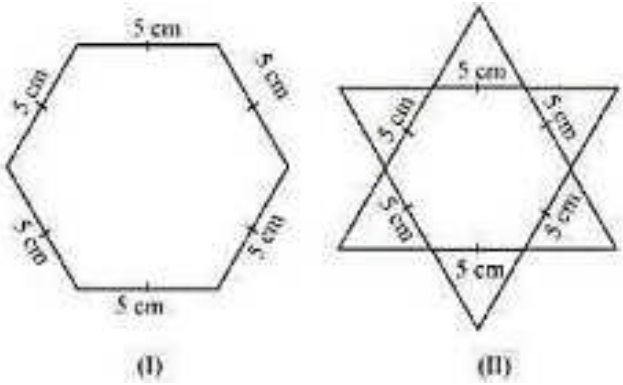
Maximum number of persons can approach the ice-cream parlour if it is equidistant from A, B and C. Now, A, B and C form a triangle. In a triangle, the circumcentre is the only point that is equidistant from its vertices. So, the ice-cream parlour should be set up at the circumcentre O of ΔABC.



In this situation, maximum number of persons can approach it. We can find circumcentre O of this triangle by drawing perpendicular bisectors of the sides of this triangle.

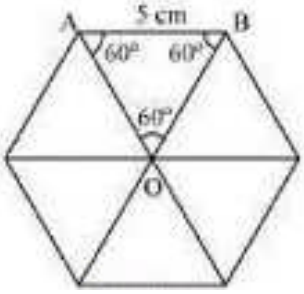
Question 4:

Complete the hexagonal and star shaped *rangolies*(see the given figures) by filling them with as many equilateral triangles of side 1 cm as you can. Count the number of triangles in each case. Which has more triangles?



Solution 4:

It can be observed that hexagonal-shaped *rangoli*has 6 equilateral triangles in it.



Area of $\Delta OAB = \frac{\sqrt{3}}{4}(\text{side})^2 = \frac{\sqrt{3}}{4}(5)^2$

$= \frac{\sqrt{3}}{4}(25) = \frac{25\sqrt{3}}{4}\text{cm}^2$

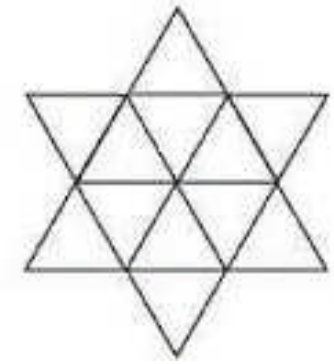
Area of hexagonal-shaped *rangoli*$= 6 \times \frac{25\sqrt{3}}{4} = \frac{75\sqrt{3}}{2}\text{cm}^2$

Area of equilateral triangle having its side as 1cm$= \frac{\sqrt{3}}{4}(1)^2 = \frac{\sqrt{3}}{4}\text{cm}^2$

Number of equilateral triangles of 1 cm side that

can be filled in this hexagonal-shaped *Rangoli*$= \frac{\frac{75\sqrt{3}}{2}}{\frac{\sqrt{3}}{4}} = 150$

Star-shaped *rangoli*has 12 equilateral triangles of side 5 cm in it.



Area of star-shaped *rangoli*= $12\times \frac{\sqrt{3}}{4}\times(5)^2 = 75\sqrt{3}$

Number of equilateral triangles of 1 cm side that can be filled in this star-shaped *rangoli*= $\frac{75\sqrt{3}}{\frac{\sqrt{3}}{4}} = 300$

Therefore, star-shaped rangoli has more equilateral triangles in it.

Topic:Tissue

Definitions:

1. *Differentiation*: It is the process of qualitative changes in the cells to perform different functions in living organisms.
2. *Primary growth*: It is the increase in length that results from cell division and differentiation of an apical meristem.
3. *Secondary growth*: It is the increase in width or girth that results from cell division and differentiation of lateral meristem.
4. *Vascualar bundles*: It is the conducting tissue of a plant that is formed of xylem and phloem.
5. *Monocot*:- These are the plants whose seeds have only one cotyledon. Example, corn seeds, Rice, garlic, etc.
6. *Dicot*:-These are the plants whose seeds have two cotyledons. Eg. Beans, peaches, etc.
7. *Sarcomere*:- The smallest functional unit of myofibril which occurs as repeated units along the length of myofibrils.
8. *Myofibril*: It is a muscle fibre which is basic rod like unit of a muscle.
9. *Nerve impulse*: It is a self-propagated electro-chemical current that travels from one neuron to another for the passage of message.
10. *Synapses*: It is the functional junction between neurons.

Tissue:

A tissue may be defined as a group or cluster or collection of similar or dissimilar cells that perform or help to perform a common function and have a common origin.

The word 'tissue' is derived from a French word 'Texo' meaning 'to weave'. It was first given by a French Biologist namely 'Bichard'. Study of tissues is called 'Histology'.

Types of Tissues: There are two types of tissues:

1. Plant Tissues.
2. Animal Tissues.

1. *Plant Tissues*:

Plant tissues are divided into two types:

i) Meristematic Tissues ii) Permanent Tissues

i) *Meristematic Tissues*:-

They are simply called Meristems. They are formed by a cluster of cells. They have the ability to divide continuously. They never stop dividing.

When they stop dividing, they result in the formation of permanent tissues. When they divide continuously, they help a plant to increase in length as well as in girth. They are responsible for both primary growth as well as the secondary growth of a plant.

Characteristics of meristematic tissues:

1. The cells of meristematic tissues are similar in structure and have thin and elastic cell walls made of cellulose.
2. The meristematic cells may be oval, rounded, polygonal or rectangular in shape.
3. They are compactly arranged without intracellular spaces between them.
4. Each cell contains dense and abundant cytoplasm and a large prominent nucleus.
5. It contains few small vacuoles or no vacuoles at all.
6. New cells are produced, take up a specific function and lose the ability to divide and thus form permanent tissue.

Occurrence:

Depending upon the occurrence and position in the plant body, meristematic tissue is divided into three types:

i) Apical meristem.
ii) Lateral meristem.
iii) Intercalary meristem.

i) *Apical meristem*:-

This meristem is located at the growing apices of main and lateral roots, stems and leaves. These cells are responsible for linear growth of an organ. It thus, results in the increase in the length of plant which is called primary growth.

ii) *Lateral Meristem*:

This meristem occurs on sides almost parallel to the axis of roots, stems and its branches.

It brings about an increase in the width or girth of the plant which is called as secondary growth. Lateral meristem is of two types.

1. Cork cambium
2. Vascular cambium

1. Cork cambium: The lateral meristem which occurs beneath the bark of a plant is called cork cambium.

2. Vascular cambium: The lateral meristem which occurs in vascular bundles of dicots is called vascular cambium.

iii) Intercalary meristem:-

This meristem is located at the base of leaves or at the base of node and internode. It is also present in the regions of permanent tissues. It is responsible for growth in length.

3. ***Permanent Tissues***:

It may be defined as a group or collection of living or dead cells formed by meristematic tissues and have lost their ability to divide and are permanently placed at fixed positions in plant body.

Characteristics Of Permanent Tissues:

1. They constitute a major portion of plant body.
2. Their cells have lost the power of division.
3. Cells are mature, thin or thick, living or dead.
4. These may be oval, rounded, polygonal, elongated, etc.
5. They have intercellular spaces.
6. They have vacuolated cytoplasm.

Simple Permanent Tissue:-

It is a type of permanent tissue which is composed of similar type of cells. These cells are structurally and functionally similar. On the basis of nature of cells, simple permanent tissues are divided into three types:

1. Parenchyma
2. Collenchyma
3. Sclerenchyma

1. *Parenchyma*:-

It is derived from two words 'para' meaning 'besides' and 'enchyma' meaning 'to pour' or 'enchein' meaning 'in fillings'.

General characters:

1. It is most simple and unspecialized primitive tissue.
2. It mainly consists of thin walled cells which have intercellular spaces between them.
3. Cell wall is made of cellulose or calcium pectate.
4. Each cell has a prominent nucleus and vacuolated cytoplasm.
5. Cells are living and perform metabolic activities/ processes.
6. It forms the basic packing tissue of plant body and is the most abundant tissue of the plants.

Shape: Cells may be isodiametric, spherical, cylindrical, rectangular, stellate or long spindle, etc.

Distribution: Parenchyma is widely distributed in various plant organs i.e. roots, stems, leaves, flowers and fruits. They are found in endosperm of seeds, xylem and phloem. Types

Parenchyma is of three types:

1. Storage parenchyma
2. Arenchyma
3. Chlorenchyma

1. Storage parenchyma: It is that type of parenchyma in which cells enlarge and store nutrients and water e.g. starch in the parenchyma of potato.

2. *Arenchyma*: It is that type of parenchyma that has large air cavities to give buoyancy to the plant e.g. aquatic plants like hydrilla.

3. *Chlorenchyma:* It's that type of parenchyma that contains chloroplasts and thus performs photosynthesis e.g. leaves.

Functions Of Parenchyma

1. The main function of parenchyma is storage of food e.g. starch in parenchyma of potato.
2. In fleshy stems and leaves, parenchyma cells serve as water storage tissue e.g. opuntia (cactus)
3. It forms the framework of all the plant organs and tissues by providing rigidity to the plant and thus help to maintain shape and firmness of plant body.
4. It stores waste materials of the plants such as latex, resins, gums, etc.
5. The: intercellular air spaces of parenchyma cells allow gaseous exchange.
6. It provides buoyancy in aquatic plants.
7. If chloroplast is present in parenchyma cells, it performs photosynthesis.
8. It serves as the packing tissue in between the other tissues.
9. It provides mechanical strength to the plants due to its compact arrangement.

***Collenchyma*:-**

It's derived from two words 'colla' and 'enchyma'. Colla means glue and enchyma means - to pour.

General characters

1. It is a living tissue.

2. Cells are thin walled but possess thickenings of cellulose or pectic substances at the corners where a number of cells join together.
3. Cells are compact.
4. Intercellular spaces are absent.
5. It provides flexibility to soft ariel parts of plants so that they can bend without breaking.
6. It may contain a few chloroplasts.

Shape: Collenchyma cells are usually elongated with oblique end walls. In transverse section they appear circular, oval or polygonal.

Distribution: Collenchyma occurs in dicot stem and leaves. It's mainly absent in monocots and in roots.

Functions Of *Collenchyma*

1. It provides mechanical support, protection and elasticity to the plant organs.
2. It manufactures sugar and may store it as starch.
3. It is present at the margins of some leaves and resists tearing effect of wind.
4. It allows easy bending in various parts of the plants without breaking it.

Sclerenchyma:-

It is derived from two words; sclern from sclerous which means hard and enchyma which means in fillings.

General characters:

1. It consists of thick walled dead cells.
2. Those cells have hard and extremely thick cell wall due to uniform deposition of lignin (a complex organic molecule composed of phenyl propanoid units associated with cellulose).
3. Lignin deposition is so thick that the cell wall becomes strong, rigid and impermeable to water.
4. The cell lumen becomes very narrower rarely absent.'
5. Cells are closely packed without intercellular spaces.
6. Cells are cemented with the help of middle lamella [a wall that lies between the adjacent cells].

Shape:- Cells appear as hexagonal net in transverse section.

Types: Sclerenchyma is of two types:

1. Fibres
2. Sclereids

1. *Fibres*:-

These are long, elongated cells with pointed ends. These cells vary in length from 1mm to 550.mm in different plants. The fibres are usually clustered into strands and look polygonal.

2. *Sclereids*:

These are short and possess extremely thick lignified walls. They vary greatly in their shape and size. They may be spherical, oval, cylindrical, dumble shaped or stellate.

Distribution: Sclerenchyma tissue mostly occurs in xylem and phloem, hard seed coats and husk of coconut.

Functions:

1. The main function of Sclerenchyma is to give mechanical support to the plants.
2. It provides a protective covering around seed and nut.
3. Sclerenchyma fibres in plants like jute, coconut etc are commercially exploited.

Complex Permanent Tissues: A complex permanent tissue may be defined as a group of more than one type of cells having a common origin and working together as a unit to perform a common function. The complex tissues are mainly concerned with the transportation of water, minerals and food materials. The important complex tissues in plants are:

1. Xylem or wood
2. Phloem or Bast

Both xylem and phloem are together called as vascular tissues or vascular bundles or conducting tissues.

1. Xylem:-

It is derived from Greek word 'xylos' which means 'wood'. It was first of all seen by a biologist Nageli in 1858.

It's a chief conducting tissue responsible for conduction of water and minerals. This tissue is composed of four kinds of cells.

1. Tracheids

2. Vessels
3. Xylem parenchyma
4. Xylem fibres

1. *Tracheids*:

These are elongated, tube like dead cells with oblique end walls. The end walls remain intact and possess pits, since tracheids do not have open ends, so water has to pass through pits. These usually appear polygonal. The walls are hard and lignified.

2. Xylem vessels or Trachea:

The cells of vessels are placed one upon the other and their end walls are either absent or possess perforations. They form long tubes or channels for conduction of water and minerals. Tracheids and vessels are meant for conduction of sap, so they are also called as tracheary elements.

3. Xylem parenchyma:

These are living parenchymatous cells present in the xylem. They help in lateral conduction of organic solutes and storage of food reserves.

4. *Xylem fibres:* These are lignified fibres present in the xylem which provide mechanical strength to the plant body.

Functions of xylem:

1. Xylem is a major conducting tissue in plants. It serves in the upward movement of water and mineral salts from roots to different parts of the plants.
2. It gives mechanical strength to the plant body.

2. Phloem (bast):-

It's derived from a Greek word 'phlois' which means inner bark. It was first of all used by Nageli in 1858. Phloem is the chief food conducting tissue of the plants. Phloem is composed of four elements.

1) Sieve tubes
2) Companion cells
3) Phloem parenchyma
4) Phloem fibres

1) Sieve tubes: These are long tubular structures composed of elongated sieve tube elements placed one above the other forming a continuous tube. The end walls of sieve tube elements are called sieve plates which are

perforated by numerous pores. Each mature sieve tube element has thin or thick cellulose wall. Cytoplasm occurs in the form of thin lining enclosing a big central vacuole. Nucleus, plastids, endoplasmic reticulum, etc are absent.

2. Companion cells: These are living cells which are always associated with sieve tubes. Each companion cell is living with thin cellulose walls. It possesses nucleus, mitochondria, ER, etc. The common wall between sieve tube and companion cell shows the presence of pits.

3. Phloem parenchyma: These are the living parenchymatous cells present in the phloem. They store food, raisins, latex, etc. These cells help in slow conduction of food especially to the sides.

4. Phloem fibres:- These are the dead sclerenchymatous fibres present in the phloem. They occur in sheets or cylinders. They provide mechanical strength to the plants.

Functions of phloem:

1. The main function of phloem is translocation of organic solutes from leaves to the storage organs
2. It provides mechanical support to the plant body.

Animal Tissues:

The body of animals is made up of different types of tissues which perform specific functions. On the basis of function they perform, animal tissues can be broadly classified into following types:

1. Epithelial tissue
2. Muscular tissue
3. Connective tissue
4. Nervous tissue

Epithelial tissue

General characters:

1. Epithelial tissue or epithelium is a simplest kind of animal tissue that occurs as a protective covering.
2. It consists of one or more layers of cells.
3. The cells are closely packed.
4. Intercellular spaces may or may not be present.
5. Cells are held together by intercellular junctions.
6. The epithelial tissue rests on a thin, non-cellular basement membrane, (a membrane that doesn't contain cells and consists of glyco-proteins and collagen fibres).
7. Blood and lymph vessels are absent. However, nerve cells are present.
8. The blood vessels lie in the connective tissue across the basement membrane.

Occurrence: It is found on the external surface of the body, internal organs (or viscera), lining of the cavities.

Functions:

1. It covers the body surface as an outer layer of skin.
2. It provides protection to the underlying tissues from mechanical injury, drying up, entry of germs.
3. It forms inner lining of mouth, elementary canal and other internal organs and protects these organs.
4. Epithelial line of intestines absorbs water and digested food.
5. It helps in the elimination of waste products.

6. Epithelial lining of the cavities give rise to glands that provide secretion such as mucus, etc.

Types of Epithelium:

Based on the shape of the cells, epithelial tissue is classified as follows:

1) Squamous epithelium.
2) Cuboidal epithelium
3) Columnar epithelium
4) Ciliated epithelium
5) Glandular epithelium
6) Sensory epithelium

1. Squamous epithelium*:*

This epithelium consists of thin, flat irregular shaped cells which fit together closely. It is of two types.

a) Simple squamous epithelium
b) Stratified squamous epithelium

a) *Simple squamous epithelium:* The cells in this epithelium are extremely thin and flat and are arranged edge to edge forming a delicate lining or covering. So, it is also called as pavement epithelium.

Occurrence: It lines the blood vessels, urinary tubules and alveoli of the lungs.

b) Stratified squamous epithelium: The cells in this epithelium are arranged in many layers to prevent wear and tear.

Occurrence: It forms the epidermis of the skin. It also lines buccal cavity (mouth cavity), pharynx, oesophagus, anal canal, vagina and lower part of urethra.

Functions:

1. It provides protection to the underlying parts against injury and entry of germs.
2. It helps in excretion, gas exchange, etc.

2) *Cuboidal epithelium*: This epithelium consists of cube like cells which are about as tall as wide.

Occurrence:

1) It lines the salivary ducts, pancreatic ducts, sweat glands, etc.
2) It also covers the ovaries and lines sperm producing tubules.

Function

It helps in protection, secretion, absorption, excretion and gamete formation.

3) Columnar epithelium: This epithelium consists of tall or pillar like cells that are much taller than wide. The nuclei are generally elongated.

Occurrence

1) It lines the stomach, intestine and gallbladder.
2) It also lines mammary gland ducts and parts of urethra. *Functions*:

It helps in protection, absorption and secretion.

4) Ciliated epithelium:

Structure: This epithelium consists of cuboidal or columnar cells that bear cilia on their free surfaces.

Occurrence: Cuboidal ciliated epithelium lines certain parts of urinary tubules and sperm ducts. Columnar ciliated epithelium lines nasal passage, oviducts, bronchioles and ventricles of brain.

Functions:

It helps in the movement of mucus, eggs, urine, sperms and ceribo spinal fluid.

5) Glandular epithelium*:*

Structure:- This epithelium consists of columnar cells modified to secrete chemicals or juices.

Occurrence: It lines the glands such as gastric glands, pancreatic glands, intestinal glands, etc.

Functions: It helps in secretion of juices and chemicals.

6) *Sensory epithelium*:

In some cases, the epithelial cells become modified to receive external stimuli. Such sensory cells have nerves so that they can perceive various stimuli.

Occurrence: It is found in nasal passage, taste buds, retina of eyes, etc.

Muscular Tissue:

Muscular tissue of the body consists of long, narrow muscle cells. These cells are elongated in structure and are therefore called as muscle fibres or myocytes. These myocytes inturn contain many chains of myofibrils. Myofibrils are composed of actin and myosin filaments repeated in units called sarcomere. This sarcomere is responsible for striated appearance of

muscle fibres. A muscle fibre may contain one or more nuclei. Muscle cells are arranged in parallel manner and contract in a definite direction which causes movement of body parts. These movements are brought about by contraction and relaxation of contractile proteins (actin and myosin) present in the muscle cells.

Types of Muscular Tissue:

There are three types of muscular tissue:

1) Striated muscles
2) Unstriated muscles
3) Cardiac muscles

Striated muscle *(skeletal muscle or voluntary muscle)*

Characteristics

1) The striated muscles form more than 80% of the mass of soft tissues in a body.
2) They are attached to bones by tendons and help in the movement of external body parts.
3) The striated muscles consist of long, narrow, cylindrical, unbranched fibres with blunt ends.
4) Each fibre is enclosed in a thin, plasma membrane called sarcolemma.
5) The cell contains many elongated, flattened nuclei located towards the sarcolemma.
6) The multi-nucleate condition of the fibres results from cell fusion.

Occurrence:

1) These are found in the body wall and the limbs.
2) They also occur in tongue, pharynx and beginning of oesophagus.

Functions:

1. They help in the movement of body parts and locomotion.
2. They also help in several voluntary movements of the body.

Q) Why are striated muscles called as skeletal, voluntary and striated muscles?

Ans. Striated muscles are called as skeletal muscles because they are

attached to bones and help in movement of body parts. They are also known as voluntary muscles because they are under our control. They are known as striated muscles because they contain dark and light bands.

Unstriated muscle:

Characteristics:

1. These are called smooth or unstriated muscles because they do not show any strips or striations across the muscle fibres.
2. Each cell is long, narrow, spindle-shaped with pointed ends and has only one nucleus situated in the centre.
3. These fibres are generally shorter than the striated muscle fibres.

Occurrence:

1. These occur within the walls of tubular, internal organs (visceral organs) except heart. e.g. Alimentary canal, Genital tract, blood vessels, etc.
2. They also occur in the iris and ciliary body of the eye and dermis of skin.

Functions:

1. Smooth muscles are called involuntary muscles.
2. Their contractions are rythmic.
3. These muscles contract slowly but can remain contracted for a long period of time.
4. Rythmic contractions of these muscles in the walls of tubular organs results in the rhythmic progressive wave of muscular contraction and relaxtion. (peristalisis).
5. These movements occur in gastro-intestinal tract and male genital tract.
6. In some organs, the smooth muscles contract throughout the organ as a single unit and produce extrusive movements as in urinary bladder, gall-bladder, ureters and uterus.

Cardiac muscles:

Characteristics:

1. The cardiac muscle consists of short, cylindrical fibres which are branched and joined to form a network.
2. Each fibre or cell contains one or two nuclei situated in the centre.
3. Intercalated discs occur between the ends of fibres.

4. The cell show light striations.
5. These are involuntary muscles.

Occurrence:

Cardiac muscles are confined to the wall of heart, pulmonary vein and superior venacava.

Functions:

These contract and relax rapidly and continuously with a rhythm.

Nervous tissue:

The nervous tissue contains densely packed nerve cells, called neurons (Greek neuron- nerve). It is present in the brain, spinal cord and nerves. The neurons are specialized for conduction of nerve impulses.

They receive stimuli from within or outside the body and conduct impulses (signals) which travel from one neuron to another. Each neuron is composed of following three parts:

i) Cyton ii) Dendrites iii) Axon

i) Cyton or cell body or soma: The cell body of neuron is called cyton or soma. It is a broad, rounded, pyriform (ear shaped) or stellate part of neuron. It has cytoplasm called neuroplasm and relatively large, spherical nucleus. It also contains nissll granules.

Function:

It receives nerve impulses from dendrites and transmits them to axon.

ii) Dendrites (singular Dendron):

It is a short, tapering, much branched protoplasmic processes stretching out from cell body.

Function:

It conducts the nerve impulses towards the cell body.

iii) *Axon*:

It is single, very long, cylindrical protoplasmic process of uniform diameter arising from cell body. At its terminal end, axon is highly branched. The terminal branches are called terminal arborizations. At their ends are swollen structures called synaptic knobs or bouton that have neuro transmitter called acetycholine.

Axon is covered with one or two sheaths (coverings). The cell membrane of axon is called axolema and its cytoplasm is called axoplasm. The single

sheath present over the axon is called neurilemma. It may have an additional insulating and protective sheath of myelin around it. It is present between neurilemma and axolemma. Axons having myelin sheaths are termed myelinated nerve fibres and those without this sheath are termed non-myelinated nerve fibres. At intervals, myelinated nerve fibres possess unmyelinated areas called nodes of ranvier.

Function: Axons carry impulses away from the cell body to another neuron.

Connective tissue:

General characters:

1. The cells of connective tissue are living.
2. These cells remain separated from each other.
3. The space between the cells is filled with non-living, soft, gel like matrix or medium.
4. Matrix may be fibrous in nature and composed of complex carbohydrates linked to proteins. The fibres present in it are:-

1. White collagen fibres.
2. Yellow elastin fibres.
3. Reticular Reticulin fibres, and complex carbohydrates present in it are GAG glucose amino glycans or muco polysaccherides.
4. Matrix may be solid as in case of bones and cartilages and fluid as in case of blood.

Functions:

1. It serves the function of binding and joining one tissue to other i.e. connecting bones to each other, muscles to bones, etc.
2. It forms a supporting framework of bones and cartilages for the body.
3. It forms a protective sheath and packing material around various organs separating them so'that they do not interfere in each other's activities, carrying material from one part of the body to another.

Connective Tissue:

Types:

In animals there are five types of connective tissue:

1) Areolar tissue
2) Dense regular connective tissue
3) Adipose tissue
4) Skeletal tissue
5) Fluid connective tissue

1) *Areolar tissue*:

It is also called as loose connective tissue. It is a loose and cellular connective tissue. It is most widely distributed in the body. It consists of transparent, jelly like sticky matrix containing numerous fibres and cells and mucin. Its matrix consists of two kinds of fibres.

a) *White collagen fibres*: They are made up of a protein, collagen which changes into gelatin on boiling in water.

b) Yellow elastic fibres: They are made up of a protein elastin. Collagen fibres provide flexibility and strength and elastic fibres provide elasticity. Several kinds of irregular cells for example fibroblasts and macrophages are present in it.

Occurence:

It is simple and most widely distributed connective tissue. It joins skin to muscles, fills spaces inside organs and is found around muscles, blood vessels and nerves.

Functions:

(i) It is a supporting and packing tissue between organs lying in the body cavity. Matrix of this tissue is important in diffusion of oxygen and nutrients from small blood vessels. (ii) It helps in repair of tissues after an injury.

(iii) It fixes skin to underlying muscles.

***2) Dense regular connective tissue**:*

It is a fibrous connective tissue. It is characterised by ordered and densely packed collection of fibres and cells. Fibres are loose and very elastic in nature. It is the principal component of tendons and ligaments.

1. *Tendons*: They are cord like, strong, inelastic structures that joins muscles to bones. A tendon is a bundle of white collagen fibres bound together by aerolar tissue. It has great strength but its flexibility is limited.

2. *Ligaments*: They are elastic structures which connect bones to bones. A ligament is highly elastic and has great strength but contains very little matrix. In ligament, some elastic and many collagen fibres are bound together by areolar connective tissue. Fibroblasts are irregularly arranged.

3) *Adipose tissue*:-

It is an aggregation of fat cells or adipocytes. Each fat cell is rounded or oval and contains a large droplet of fat that almost fills it. The fat cells are arranged in lobules separated by partitions of collagen and elastin fibres. These partitions carry blood vessels.

Occurence:

It is abundant below the skin, between the internal organs for example around the kidneys.

Functions:

1. It serves as a fat reservoir.
2. It provides shape to the limbs and the body.
3. It keeps visceral organs in position. It forms shock absorbing cushions around kidneys and eyeballs.
4. It acts as an insulator.

4) Skeletal Tissue:

The skeletal or supporting tissue includes cartilage and bone which form the endoskeleton of vertebrate body.

1. *Cartilage*:

It is a specialised connective tissue which is compact and less vascular. It has widely spaced cells. Its matrix is composed of proteins and is slightly hardened by calcium salts. Its matrix is produced and maintained by chondrocytes. Matrix is solid, cheese like and firm but also somewhat elastic. This accounts for its flexible nature. Matrix of cartilage have a delicate network of collagen fibres and living cells, chondrocytes. Chondrocytes are present in fluid filled spaces known as lacunae. Blood vessels are absent in matrix. Chondrocytes help in internal growth of cartilage by multiplying. Thus cartilage is capable of continued and rapid growth.

Occurence:

It is located in ear pinna, nose tip, epiglottis, intervertebral discs, end of long bones, lower ends of ribs and rings of trachea.

Functions:

It provides support and flexibility to the body parts. It smoothens surface at joints.

2) *Bone*

Nature:- Bone is a very strong and non-flexible tissue. Like cartilage, bone is a specialised connective tissue. It is porous, highly vascular, mineralised, hard and rigid. Its matrix is made up of proteins e.g. osteonectin, osteocalcin, proteoglycan and collagen). Matrix of bone is heavily coated with salts of calciurn and magnesium such as phosphates and carbonates of calcium and magnesium (e.g.
Hydroxyapatite). These minerals are responsible for the hardness of the bone. The matrix of bone is in the form of thin concerntric rings, called lamellae. Bone cells, called osteoblasts or osteocytes, are present between the lamellae in fluid-filled spaces called lacunae. All lacunae of the bone communicate with each other by network of fine canals, called canaliculi. Each canaliculus is filled with delicate
cytoplasmic process of the bone cell. Through canalculi each bone cell of each lacuna receives food and oxygen and eliminates waste.

Functions:-Bone forms endoskeleton of human beings and other vertebrates except the sharks. It serves the following

Functions:

1. It provides shape to the body.
2. It provides skeletal support to body.
3. It protects vital body organs such as brain, lungs, etc.
4. It serves as storage site of calcium and phosphate.
5. It anchors the muscles.

Fluid Connective Tissue (Vascular Tissue):

It links the different parts of the body and maintains continuity in the body. It includes blood and lymph.

Blood:- It a fluid connective tissue. It is reddish coloured due to presence of a pigment called as haemoglobin. This blood carries various functions in our body.

i) Circulation of blood is responsible for transportation of soluble digested food from small intestines to various parts of body. Blood also carries glucose from liver to muscles,

ii) Blood carries soluble excretory materials such as urea to organs of excretion.

iii) Blood carries hormones from endocrine glands to target parts

iv) Circulation of blood helps to maintain constant body temperature by

distributing excessive heat from deeply seated organs.

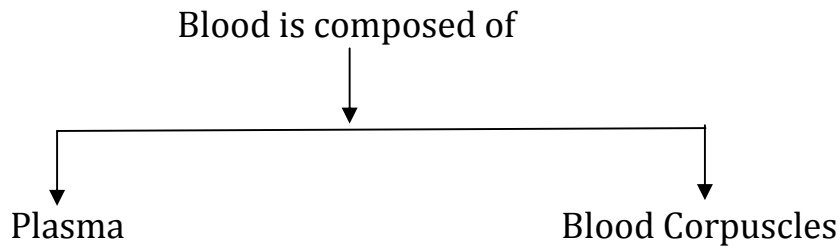
v) Blood transports O_2 from lungs to all parts of body.

vi) Blood carries CO_2 produced by the tissues to the lungs for breathing out.

vii) WBC of blood acts as soldiers of body by killing bacteria and other germs.

viii) It acts as a buffer and maintains a constant pH which maintains the concentration of solute potential of blood i.e. electrolytes.

Composition of blood



Plasma:-It is liquid part of blood in which different blood cells are present. It is straw coloured or can be colourless. It contains major portion of water (90%) and also (10%) of organic / inorganic substances. The different organic substances that are present in it are urea, amino acids, proteins, hormones and the different inorganic substance present in it are sulphates, phosphates, magnesium. Besides, the organic and inorganic substances, it also contains a blood clotting protein called fibrinogen and also contains Anti-coagulant called heparin. If fibrinogen is removed from blood, it results in the formation of serum in plasma. (Serum- A blood plasma from which blood clotting protein is removed).

Different types of blood cells:

i) RBC ii) WBC

iii) Platelets

RBC's : These are also called erythrocytes. These are small, round, biconcave, disc-like structures that are thinnest at the centre. The real colour of RBC is pale yellow but appear red due to presence of haemoglobin. These are 7-8 um in diameter and are denucleated (to transport more O_2). In males, the number of RBC's is 5.5 m/cm^3 and females 4-4.5m/cm^3. RBC have a life span of 120 days and main constituent of RBC is haemoglobin. Due to less presence of RBC's a disease called anaemia is caused which causes breathlessness. If there is more amount of haemoglobin present in blood, it leads to abnormal growth of RBC and thus leads to cancer called polycythemia. Formation of RBC is called

erythropoiesis and is formed in red bone marrow. These RBC's get degraded in liver. Shrinking of RBC's in liver is called erytopis. The content of haemoglobin:
In males is 15.5 +/- 2.5 gm/decileter
In females it is 14.0 +/- 2.5gm/decileter
In children it is 11.0 +/- 2.5 gm/decileter (4 -12 years).
WBC's:-These are also called leucocytes. These are colourless and amoeboid shaped/ irregular). These are large in size than RBC's and are fewer in number. The number of WBC's in males and females is same 5000mm^3. These are nucleated i.e. they have nucleus. There are various types of WBC's like monocytes. Basophills, neutrophills, eosinophills, lymphocytes. WBC's are of two types: Phagocytes and Immunocytes.
Immunocytes: These produce antibodies and are involved in immune response. They include lymphocytes.
Phagocytes: These are capable of phagocytoses and they carry out the function of body defense by engulfing bacteria and other foreign substances. Phagocytes are of two types:
Granular and agranular.
Granular WBC's: These have granular cytoplasm and lobed nucleus. These are of three types basophills, neutrophills, eosinophills.
Agranular WBC's: These have smooth cytoplasm and lobed nucleus e.g. monocytes, lymphocytes. WBC's don't have a particular life span because they are of different types. So, their life span varies like lymphocytes. They have a life span of almost 3-4 days. They provide immunity to body when foreign material enters our body i.e. antigen and our body responses to it. The WBC's engulf it and form a protein called antibodies. These are also called soldiers of our body.
Most WBC are amoeboid and can throw out pseudopodia by which they can squeeze out through the walls of capillaries into tissues. This process is called diapedesis. If more no. of WBC are present in body it will lead to a disease (cancer) called leukaemia.
If less no. of WBC's is present, it will lead to a.disease called leucopoenia. These are formed in white and yellow bone marrow.
Blood Platelets: These are also called thrombocytes. These are small, spherical structures numbering about 4,00,000/mm^3 . These have life span of 2-3 days and are denucleated. It contains a blood clotting protein called thrombin. The function of B.P. is to form a solid plug at the time of injury

which prevents further blood loss.

Lymphatic system:

Lymph: It is light yellow colour, mobile, fluid connective tissue which drains into lymphatic capillaries from inter cellular spaces. Its composition is similar to that of blood except that RBC's and some blood proteins are absent in it. WBC's are found in abundance.

Functions of Lymph

1) Lymph absorbs some of the fluid from digestive tract. It passes proteins to tissues. It carries digested fat.
2) It drains excess fluid from extra cellular spaces back in the blood.
3) It protects the body by killing germs.
4) It carries carbon dioxide and nitrogenous waste materials from tissues to blood.

Topic: Why do we Fall ILL

1. *What is health?*

a. According to World Health Organisation (WHO) (1948), health is defined as:

Health is a state of complete physical, mental and social well being, and not merely an absence of disease or infirmity. Health is a state of body when all the organs and systems are functioning properly and a perfect balance is maintained between the environment and the body." So health has three dimensions:

i) Physical health involves perfect functioning of all the organs and systems of body.

ii) Mental health means a state of harmony and balance between the individual and the surrounding.Individual is free from anxiety and tension,

iii) Social health means a man having good job, a good house, a happy family, good neighbours andunderstanding friends.

Factors Affecting Health

i) Physical environmental factors like light, temperature, natural disasters like cyclone, flood, soil- type, rainfall etc.

type, rainfall, etc.

ii) Social environmental factors like job conditions, housing conditions, family's atmosphere andrelationship between neighbourers and friends.So social equality and harmony are necessary forgood health of individuals. Social environment determines our physical environment

iii) Public cleanliness so as to avoid accumulation of garbage, blocking of drainage, open and stagnantwater, etc. which may increase the chances of poor health.

iv) Supply of balanced diet for good health as it is essential for the normal body functioning, growth and development of body.

v) Good economic conditions and good purchasing powers increase the chances of good health.

This proves that personal and community issues both play important role in determining individual's health.

Characteristics of Good Health

The important characteristics of a person having good health are:

i) Free from sickness and diseases.
ii) Free from unnecessary anxiety.
iii) Free from social and psychological tensions.
iv) Self confidence.
v) Feeling of joy in living.
vi) Ability to work efficiently and at his best.

Importance of Good Health

Good health is one's real wealth. A healthy person is always cheerful, active, willing worker and energetic. Good health increases one's efficiency for doing work. This contributes to hisown progress, the progress of his family, the progress of his community and the progress of nation as a whole.

Disease

(dis = against; ease = comfort)

Any condition which interferes with the normal functioning of the body and impairs the health is called disease. It involves morphological (structural), physiological (functional) or psychological disturbance in some body parts. It may be due to environmental factors or pathogens or genetic anomalies.

Type of Diseases

On the basis of period of their occurrence, the diseases are classified in two categories:

1) Congenital diseases: These are inborn diseases which are present from the birth. These are generallyinheritable .

i) Diseases cause by gene-mutations e.g. haemophilia, colour blindness, etc.
ii) Diseases caused by chromosomal mutations e.g. Down's syndrome, Klinefelter's syndrome, etc.

2) Acquired diseases: These occur only after birth and are non-inhertitable. On the basis of their communication, acquired diseases are of two types:

i) Communicable disease and
ii) Non-communicable diseases.

i) *Communicable diseases*: These can be transmitted from an infected person to a healthy person by means of air, water, food, physical contact or vectors.

These are caused due to infection and multiplication of some kind of micro-organisms, so are also called infectious diseases.

Classification of communicable diseases: These can be categorized on two basis:

a) *Causative agent*, and

b) Mode of transmission

a) Depending upon the causative agent, communicable diseases are of six types:

i) *Bacterial* diseases e.g. diphtheria, whooping cough, leprosy, syphilis, tetanus, typhoid,
tuberculosis, cholera, anthrax, etc.

ii) *Viral* disease e.g. dengu, influenza, measles, polio, smallpox, chickenpox, common cold, rabies, Japanese encephalitis, AIDS, etc.

iii) *Protozoan* diseases e.g. malaria, amoebiasis, kalaazar, sleeping sickness, etc. iv) Helminth diseases e.g. taeniasis, ascariasis, elephantiasis, trichinosis, liver rot, etc.

v) *Fungal* diseases e.g. ring worm, athlete's foot, etc.

vi) *Rickettsial* diseases e.g, typhus fever, trench fever, Q-fever, Rocky mountain spotted fever, etc.

b) On the basis of their mode of transmission, the communicable diseases are of two type:

i) *Contagious* diseases:- These communicable diseases can spread from an infected person to healthy person by actual contact between them e.g. sexually transmitted diseases(STD), smallpox, chickenpox, measles, laprosy, etc.

ii) *Non-contagious* diseases:- These can spread from an infected person to healthy person with food, air or water e.g. taeniasis, ascariasis, cholera, tuberculosis, typhoid etc. or microorganisms are injected inside the human body by some carrier or vector hosts e.g. malaria, filariasis, plague, etc.

ii) Non-communicable or non-infectious diseases:

These do not spread from an infected person to a healthy person. These are of four types on the basis of their causative agents:

1. Deficiency diseases: These occur either due to deficiency of some nutrients in the diet or some

hormone e.g., kwashiorkor (protein), diabetes mellitus (insulin), dwarfism (growth hormone),
etc.
2. Degenerative diseases: These occur due todegeneration of certain body tissues e.g.cardiovascular diseases (of heart and blood vessels) and arthritis (of joints).
3. Cancerous diseases: These occur due to uncontrolled growth and divisions of cell in certain body tissues leading to tumour formation.
4. Allergic diseases: These occur due to hypersensitivity of body to certain external agents, calledallergens, e.g. asthma, hay fever, etc.

Causes Of Diseases (Etiology)

Any substance which causes a disease by its excess or deficiency or absence, is called a disease agent.
Types of disease agent
Disease agents are of five types:
1. Biological infectious agents:
These are also called pathogens (Gr. Pathos means disease; genesis means producing). These are those micro-organisms which when successfully infect the humanbody, multiply and produce toxins which interfere with the normal functioning of the body and cause a disease. These include bacteria, viruses, rickettsias, fungi, protozons, helminthes etc.
2. *Chemical agents* which may be endogenous e.g. urea uric acid, hormones, enzymes etc. or exogenous e.g. pollutants like gases, dust, metals, fumes; and allergens like spores, pollens, etc.
3. *Nutritive agents* e.g. minerals, carbohydrates, proteins, fats, vitamins and water.
4. *Physical agents* e.g. heat (stroke), cold (frost bite), radiations, sound (impaired hearing), etc.
5 *Mechanical agents:* These include injuries, fractures, sprains, dislocations, etc.
Out of these five types of disease agents, biological agents or pathogens; exogenous chemical agents like addictives (e.g. alcohol, tobacco in drugs),

pollutants and allergens; nutritive agentsphysical agents and mechanical agents are collectively called extrinsic or external factors. Onthe other hand, endogenous chemical agents and genetic mutations are collectively calledintrinsic or internal factors affecting the human health. The diseases caused by the intrinsic factors are called internal factors affecting the human health. The diseases caused by the intrinsicfactors are called organic or metabolic diseases and include genetic diseases like haemophilia, sickle-cell anaemiaand four types of non-communicable diseases e.g. heart attack, arthritis,diabetes, haemophilia, allergy, etc.

These five types of disease agents are called primary or immediate causes of the diseases, while the chances of diseases are further increased by certain contributory causes like:

i) Lack of good nourishment and poor heredity (second- level cause) which decrease the disease-resistance power of an individual.

ii) Genetic differences between the organisms.

iii) Poverty and lack of public hygiene services (third -level causes) which increase the chances of diseases.

Means Of Spread Of Diseases (Epidemiology)

(Modes Of Transmission)

Communicable diseases are those diseases which can be transmitted from reservoir or source of infection or an infected person to the healthy but susceptible persons. There are two modes of transmission:

i) Direct transmission, and

ii) Indirect transmission.

i) Direct transmission: In this, the pathogens are transmitted from an infected person to a healthy person directly without an intermediate agent. It occurs in the following ways:

a) *By direct contact with an infected person*: (i.e. hand shake, mouth-to-mouth kissing, etc) e.g. contagious diseases like chickenpox, smallpox, measles, leprosy, ringworm, gonorrhoea, syphilis etc.

b) *Droplet infection* (coughing, sneezing and spitting of infected person) e.g. pneumonia, diphtheria, influenza, tuberculosis, common cold, whooping

cough, etc. These are more common in more crowded living conditions.

c) *Contact with soil*. e.g. bacterial cysts of tetanus.

d) *Animal bites* e.g. rabies viruses.

e)*Transplacental transmission*:The viruses of German measles and AIDS and bacteria of syphilis can be transmitted from the maternal blood into foetal blood through placenta.

ii) *Indirect transmission*:

When the pathogens can be transmitted from the reservoir of infection to a healthy person through some intermediate agents. It occurs in following ways:-

a) *Vector borne diseases* e.g. malaria (female Anopheles), dengue (Aedes mosquito), cholera, (housefly), sleeping sickness (Trypanosoma), kala-azar (Leishmania) etc.

b) *Vehicle borne*:- Pathogens of cholera, dysentery, typhoid etc. are transmitted by agencies like contaminated food, water etc. Such diseases are more common in areas without safe supplies of drinking water. AIDS is spread by blood of suffering persons or semen donors.

c) *Air borne* e.g. influenza, epidemic typhus.

d) *Formite borne*:- In this, the pathogens are spread through contaminated articles like handkerchiefs, towels, crockery, etc.

e) *Unclean hands* e.g. Ascariasis (Ascariasislumbricoides) and Enterobiasis (Enterobiusvermicularis).

Sexually- transmitted diseases

STDs are those diseases which spread by sexual contact from an infected person to another person e.g. bacterial diseases like syphilis and gonorrhea, and viral diseases like AIDS.

Manifestations Of Diseases (Disease Symptoms)

Diseases are characterized by interference in the normal functioning of the body leading to impairment of health. These diseases show certain abnormal changes in the functioning or the appearance of one or more symptoms of the

body, called disease symptoms, like headache, coughing, loose motions, wound with pus,etc.

These disease symptoms are of two types:

1. Organ-specific and tissue-specific manifestations
2. Common manifestations.

1. *Organ-specific and tissue-specific manifestations* depend on the target organ which the microbes target after their entry e.g.

Target organ	**Specific manifestation**
Lung	Cough, breathlessness, chest pain and may be bloody sputum as in TB and lung cancer. Inflammation of liver
Liver	cells leading to jaundice characterized by yellowness of skin and eyes as in Hepatitis.
Intestine	Inflammation of intestinal mucosa leading to acute diarrohoea and dehydration as in cholera.
Nasal chambers	Inflammation of nasal mucosa leading to sneezing, bronchitis, coughing, fever, etc. as in influenza.
Brain	Headaches, vomiting, fits or unconsciousness.

2. Common manifestations: These are observed in a number of diseases and generally occur due to activation of immune cells in response to infectious agents. These immune cells either produce antibodies or actually attack and kill the disease causing microbes. This is manifested in the form of inflammation characterized by redness of the infected area, swelling, fever and increase in permeability of the capillaries of that area.

Severity of disease manifestations depends upon the following factors:

1. Number of microbes inside the body so the disease manifestations may be minor and unnoticeable when the number of microbes is very small while these symptoms may be large enough and life threatening when the infection is large.
2. On the tissue or organ which the microbes target e.g. HIV enters in the body through the sexual contact but spreads to lymph nodes through the blood.

Prevention of Diseases (Prophylaxis)

There are two ways of prophylactic measures:

A. General prophylactic measures
B. Specific prophylactic measures

A. General prophylactic measures

i) Air-borne diseases like pneumonia, tuberculosis, influenza, etc. can be prevented by avoidingovercrowding and providing hygienic living conditions,

ii) Water-borne diseases like cholera, typhoid, etc. are preventable by providing safe drinkingwater or use of boiled water or treatment of water to kill any microbial contamination.

iii) Contagious diseases like chickenpox, measles, smallpox, leprosy, etc. can be prevented byisolating the infected persons to avoid their close contact with the healthy persons.

iv)Vector-borne diseases like malaria, dengue, cholera, etc. can be reduced by providing cleanenvironment through public hygiene measures so as to prevent their breeding. This can be achieved through health education measures like proper sanitation of human feaces.Vectors can be killed by spraying of insecticides.

V) By providing proper and sufficient food which is essential for the proper functioning and strengthening of individual's immune system which produces antibodies to prevent the occurrence of diseases.

vi) Sexually transmitted disease like syphilis, gonorrhoea, AIDS, etc. can be prevented by havingmonogamous and faithful relationship and using condoms.

vii) Other general measures of prevention of diseases are: Proper coverage of eatables to preventtheircontamination by the vectors, proper washing of fruits and vegetables before their use, keeping the food in clean containers, washing of hands before meals, proper diet to preventdiet deficiency diseases like marasmus, kwashiorkor, etc.

B) Specific prophylactic measures:

Vaccination and Immunization: Immunity or disease resistance is the ability of an organism to resist the development of a disease while the infected person

with no disease is called immune. Immunity is provided by immune system which forms specific defense mechanism of an organism. The most peculiar feature of it is that it can differentiate between "self" (body's own cells) and "non-self" (foreign microbes).

Vaccination is the most important method of preventing infection of micro-organisms, especially of bacteria and viruses. In this, a vaccine (acts as antigen) is inoculated inside the body, before the occurance of disease, to stimulate the immune cells to produce antibodies. Vaccination is based on the principle of development of immunity after having a minor attack of infectious microbes which stimulate the immune cells. The immune cells produce the antibodies which not only recover the patient but provide immunity against future infection of that microbe. In vaccinotherapy, vaccine mimics the microbe we want to vaccinate against.

Principles of Treatment (Therapy)

There are two ways of treatment of infectious diseases:

A. *Symptom*- directed treatment.

This treatment is directed to reduce the effects of the diseases which are generally due to inflammation of certain body tissues characterized by fever, pain, sneezing, vomiting, loose motions, redness of skin, etc. It involves taking of medicines like anthistamine (to reduce inflammatory reactions because inflammation is generally caused by histamine), antipyretics like aspirin, crocin, etc. (to quickly bring down the temperature), analgesics (to reduce pain), etc. Though these drugs may provide some relief from the symptoms but do not bring cure from the disease so are temporary and short- lived measures and need to be taken at regular intervals.

B. *Pathogen*-directed treatment:-

This treatment is directed to kill the microbes with the help of certain chemicals. Different types of microbes have different and specific biochemical metabolic pathways e.g. metabolic pathways of bacteria may be different from those of higher organisms. The medicinal chemicals are aimed to block these pathways so as to inhibit the synthesis of toxic products used to block the metabolic pathways of bacteria may not block

the metabolic pathways of other organisms. Most important therapeutic chemicals are antibiotics.

Antibiotics are the chemicals, primarily produced by certain useful micro-organisms, which in low concentrations are antagonistic to the growth of harmful micro-organisms such as pathogenenic bacteria. Some medicinally important antibiotics are: aureomycin, erythromycin, neomycin, streptomycin, terramycin, chloromycetin, etc.

Ql. *What is health? State any two conditions essential, for good health.*

A. Ecologist viewed "health as a dynamic equilibrium between internal environment & external environment" . (WHO) world health organization defines 'Health as a state of complete physical, mental & social well-being & not merely an absence of disease.' The two conditions which are essential for good health are as under:

a) *Proper Nutrition*:For keeping & maintaining good health a person should take balanced diet.

b) *Personal hygiene*

Q2. Symptoms of good health

A. The symptoms of good health are as under:

a) *Good Physical health*: Means perfect functioning of the body. Signs of physical health are goodcomplexion , clear skin , bright eyes, lustrous hair, not too fat, a good appetite, sound sleep.

b) *Mental Health*: Means a person should be free from anxiety & stress.

c) *Social Well Being*: Implies harmony & integration within the individual & society.

Q3. What is disease? Define types of disease.

A. Theterm disease has come from two words 'des' means away & 'Aise' means 'ease' . Disease means uncomfortable or uneasy.

"Disease is a condition in which body health is impaired".

Disease is a condition of the body or some part or organ of the body in which its functions are disrupted". The human diseases are categorized into two types:

1) *Congenital disease*: These disease are present in an individual from birth due to geneticabnormality.
2) *Acquired disease*: These develop after birth & can be classified into:-
a) *Communicablediseases*:- These diseases are caused due to specific infectious agents or its toxic products capable of being directly or indirectly transmitted from man to man or from the environment (air, dust, soil etc.) to man.
*b) Non- communicable disease:*These diseases do not spread from infected person to a healthy person.
i) *Deficiency diseases*:These are caused due to deficiency of certain nutrients in our diet e.g. proteins, minerals. Examples, Marasmus ,Goitre, Beri - Beri etc.
ii) *Degenerative disease*:These are caused due to malfunctioning of body organs or degeneration oftissues e.g. Cancer, Kidney failure.

Q4)What are acute & chronic disease?
A. a): *Acute Diseases*: The diseases which last for very short periods of time are called acute disease e.g. common cold, dysentery etc.
b) *Chronic disease*: The diseases that last for a long time even as much as life time e.g. Cancer etc.

Q5. What is a balanced diet?
A. A balanced diet i*s* one which contains a variety of foods (proteins, fats & carbohydrates) in such quantities& proportions so that the need for energy, Amino acids, vitamins, minerals, water & roughage isadequately met for maintaining health.

Q6. What is difference between signs & symptoms?
A. Symptoms of diseases are the changes that can be presented by the patient to the doctor. e.g. headache. Signs are the basis for the conformation of any disease from symptoms.

Q7. What are various modes of transmission?
A. The modesof transmission of infectious disease are as follows:
1) Direct Transmission:

i) *By direct contact*: Diseases like leprosy, skin & eye infection are transmitted by direct contact.
ii) *By droplets*: Disease like respiratory infections transmitted by droplets i.e. coughing, sneezing or speaking & spitting etc.
iii) *By contact with soil.*
iv) Through placental transmission.
2) Indirect Transmission:-
i) By vectors ,
ii) Air borne
iii) Water borne
iv) Dirty hands & fingers.

***Illness*:-** Is a subjective state of the person who feels that he is not well.

AIDS (Acquired Immune deficiency Syndrome)
It is also called as "Slim disease". It is caused by RNA virus called as HIV (human immuno deficiency virus). It breaks down the immune system of the body. The victim becomes vulnerable to a host life-threatening infections.
It isa protein capsule containing two short stands of genetic material (RNA). It perpetuates in human cell & has ability to destroy human T4 or helper cell. It spreads throughout the body. It can pass through the blood- brain barrier & destroy brain cells causing neurological & psycho motor abnormalities.
Source of Infection: Blood & Semen are the main source.
Symptoms: AIDS patient shows signs of unexplained diarrhea lasting more than one moth. Fatigue, loss of body weight, blood platelets count decrease that cause hemorrhage & fever.
Transmission:
1) It is a sexually transmitted disease.
2) AIDS is also transmitted by blood transfusion by blood transmitted.
3) It is also transmitted through a contemned needle & syringe.
Principle of treatment
There are two methods of treatment of an infectious disease:-
1) By reducing the effects of the disease.
2) By killing the course of the disease.

Principle of prevention

Prevention of disease is better than cure. There are two ways of prevention of a disease:

1) General way of prevention of a disease:

Preventing exposure to infectious microbes.

a. For airborne microbes we can provide living conditions which are not over crowded.
b. For waterborne microbes avoid contamination of water.
c. For vector borne infections public hygiene is a basic key.

2) Specific way of prevention of a disease.

Providing proper & sufficient food.

By immune response.

Immunization

Immunization is the term used for introducing dead or weakened germs in the body of living beings for developing immunity or resistance against the particular disease.

Vaccination

Vaccination is a term cawed by Edward Jenwer for the process of administering live, weakened microbes into the body, for developing resistance to a particular disease.

A vaccine is a preparation used to produce active immunity to a disease in order to prevent the effects of infection by any organism.

The process of administrating vaccines is referred as vaccination & is done mostly by an injection. When vaccine enters the body it stimulate WBC's in the body to produce antibodies against the disease -causing germs.

Q Define the following terms:-

1) *Pathogens* are the agents which are responsible for the spread of various disease e.g. viruses, bacteria, fungi etc.

2) *Droplet infection*: Droplets are airborne. The infected person throws out tiny droplets or mucusby coughing, sneezing splitting, or even talking, thereby causing infection to others. This is called *Droplet infection.*

3) Xerophthalmia:-It is caused due to the deficiency of vitamin A (Retinol).

4) PEM (Protein Energy Malnutrition):- PEM are disease caused due to deficiency of proteins, carbohydrates & fats. E.g. Marasmus & Kwashiorkor.
5) Water- Soluble Vitamins:-Vitamin B, Vitamin C.
6) Fat -Soluble Vitamin:- Vitamin A, Vitamin D, Vitamin K.

Topic: NATURAL RESOURCES

Introduction

A resource is defined as, any means of attaining given ends or a source of supply or support generally held in reserve. Naturally resource includes total natural environment i.e. the entire surface layer of earth. All parts of earth's surface are of some use to man as they contribute to the production of necessities and comforts of mankind.

Natural Resources

Inexhaustible

Resources present in unlimited amount.

Resources are not likely to be perish by human activity or their use.

For example: Air, water and solar radiation.

Exhaustible

Resources are present in limited amount

Resources are likely to perish by the continuous use of human beings.

Renewable Resources

Can replenish themselves by quick recycling and replacement within a reasonable time.

Can last for ever with limited use

Both living and non-living resources.

Availability can be enhanced by increasing replenishment.

For example: Soil, forests, wildlife.

Non-renewable Resources

Cannot replenish themselves by recycling and replacement.

Will finally get exhausted

Only non-living resources.

Increased consumption will lead to exhaustion.

For example: Minerals and fossil fuels like coal.

Resources On earth

Biosphere is the life supporting system of earth's surface extending from a few miles into the atmosphere to the deep-sea vents of oceans. Resources on earth are land, water and air. Natural resources are components of atmosphere, hydrosphere and lithosphere. The physical portion of biosphere is divided into three groups:

1) *Lithosphere*:- It includes the solid components of the earth's crust -soil, rock, minerals and other masses. Only the outer layer of earth's crust called soil contains the living- organisms and forms part of biosphere.

2) *Hydrosphere*:- It includes all aquatic components- the ponds, rivers, lakes and the seas. Water covers about 75 percent of total earth's surface.

3) *Atmosphere*:- The atmosphere is the gaseous cover around the hydrosphere and lithosphere.

Atmosphere extends to several kilometers in height from the surface of earth. It is distinguished into four parts i.e. troposphere, stratosphere, ozonosphere and ionosphere.

The Breath Of Life : Air

Air is the mixture of gases like nitrogen, oxygen, carbon dioxide and water vapour. Gaseous envelope surrounding the earth is called atmosphere (air).

1. Earth's surface is dominated by nitrogen and oxygen contributing 78% and 21% respectively. Rest of 1% is contributed by argon and CO_2 0.03% along with hydrogen, helium, neon, krypton and many other gases in minute quantities.

Rain

The warm, moist and rising air cools and forms clouds in the sky. This happens due to heating of water bodies during day time. As air rises, it expands and cools. Cool air in the atmosphere sinks towards the ground. Due to cooling, water vapour present in air take the shape of small droplets. When a particle like dust acts as a nucleus, process of condensation is facilitated. These tiny droplets become bigger and bigger due to

condensation. When they become heavy, they fall down in the form of rain.

Air Pollution

Pollution refers to any undesirable change in physical, chemical and biological properties of our environment i.e. air, water and land which cause harmful effects to various forms of life and property.

A pollutant is a substance (e.g. dust and smoke), chemical (e.g. SO_2) or factor (e.g. heat, noise) that on release to environment has a bad effect on human interests. Pollutant can be defined as constituent in wrong amount at a wrong place or wrong time.

Air pollution is the occurrence of foreign particles or gases in the atmosphere which are harmful to man, vegetation, animals and buildings.

Effects Of Air Pollution

1) Combustion of fossil fuels increases the amount of suspended particles in air. These particles may be unburnt carbon particles or substances like hydrocarbons and lead. Lead is known to damage kidney, liver and blood formation. It may lead to anaemia, muscle paralysis, hypertension, etc. Hydrocarbons cause eye irritation, sneezing, drowsiness, etc. Suspended particulate matter (SPM) like dust causes ailments like asthama, bronchitis, etc. Regular breathing of polluted air may become the cause of allergies, cancer and heart disease.

Fossil fuels like coal and petroleum bear little quantity of nitrogen and sulphur. Nitrogen and sulphur present in these fuels when burnt release oxides of nitrogen and sulphur. Such gases show following effects:

a) On inhalation, such gases become dangerous.

b) These gases when dissolved in rain produce acid rain.

c) Coal dust etc. are a source of nuisance for households and impart a dirty look.

d) Dust, smoke and other SPM reduce the visibility.

It also leads to greenhouse effect and depletion of ozone layer. Thinning of ozone shield will allow high energetic UV radiations into earth's atmosphere and cause extensive damage to plants as well as animals.

Water: A wonder Liquid

Water is renewable resource.Water is vital to life since for all physiological activities of plants and animals, it is essential. Water is mainly present in two forms, i.e.

a) Surface water

b) Ground water.

Type of water resources

Water resources can be classified into two types i.e.

i) Fresh water resources

ii) Salt water resources.

i) Fresh water resources:- These range from ponds to lakes and large rivers. Fresh water is obtained by following three types of natural resources:

1. Rain water
2. Surface water
3. Ground water

Water Pollution

Water pollution can be defined as the addition of some substances which degrade the quality of water so that either it becomes health hazard or unfit for use.

Ground water pollution is mainly caused by:

a) Septic tanks.

b) Industries like textile, chemical and tanneries.

c) Deep well- injections and mining activities.

Surface water like streams, lake, etc. contains small amount of suspended particles and

many microorganisms. Water used for household, agriculture and industrial purposes when discharged after use is polluted with soluble, insoluble matter and even pathogens.

The- domestic effluents include human and animal excreta, detergents, plenty of organic matter in the form of food residue. Industries usually discharge waste water into ponds, lakes and rivers. Industrial pollutants are the most hazardous pollutants on land and water. The surface run-off from fields contains agrochemicals like DDT which are non- degradable.

Effects of water pollution

1. Micro-organisms use oxygen in decomposing of organic wastes causing deoxygenation of water which stimulates algal blooming.
2. Foul smell in water bodies is produced which makes it unfit for human consumption.
3. Organic wastes form a scum and sludge in polluted water which becomes unfit for industrial use.
4. Phosphates of detergents stimulate the algal growth, which is called eutrophication.
5. Compounds like mercury, arsenic and lead are neurotoxin in nature.
6. Pathogen contaminated water is known to be a cause of number of diseases like jaundice, cholera, typhoid, dysentery, etc.
7. Aquatic organisms are adapted to survive in a particular range of temperature. Any sudden change in this temperature may effect their breeding and can cause damage to their eggs and larvae.

Mineral Riches In Soil

Top layer of earth is called soil. It is the main natural resource essential for survival and development. More than four fifth of land is covered by soil. Top soil differs widely

in colour according to the types of minerals and humus components contained in them.

Structure and formation

Soil is formed due to interaction between weathering of rocks, rain, wind, temperature (physical weathering) with plants, animals and microbes (biological weathering). Pulverisation of rocks by chemical action in wet weather like hydration, oxidation, reduction, carbonation and solubilisation is called chemical weathering. It is capable of supporting life.

Soil contains:

(a) Inorganic constituents of parent rocks

(b) Organic products of living organisms

(c) Living organisms including micro-organisms

(d) Air in the pores.

Soil is formed by combined action of climatic factors such as temperature, rainfall, light etc. and biotic factors such plants and microbes on earth's crust.

There are four important components of soil. They are:

i) Mineral matter 50-60%

ii) Organic matter 10%

a) Living organisms

b) Micro-organisms

iii) Soil water 25-35%

iv) Soil air 15-25%

Soil Pollution

Soil pollution can be defined as decrease in soil fertility because of addition of some foreign elements. Soil is polluted with dumping of solid wastes generated in house hold and manufacturing units. Domestic wastes include kitchen garbage, broken bottles, cloth rags, ash, etc. Industrial wastes include flash, metal scraps, dyes, plastics, etc. Agricultural chemical and fertilizers are also the cause of land pollution. The dumping of human and fertilizers are also the cause of land pollution. The dumping of human

excreta and waste from cow-sheds and slaughter houses befouls the land. Most important causative pollutant of soil is plastics.

Effects of soil pollution

1. The industrial pollutants increase the toxicity levels of the soil.
2. Soil pollution due to domestic sewage may cause diseases like giardiasis, tetanus, etc. in human beings.
3. Land pollution may also cause several plant diseases.
4. Weedicides act as metabolic inhibitors or reduce the plant yield.
5. Mine dust causes many types of deformities in animals and human beings. It also destroys the vegetation of that area.
6. Excess of fluorides in land cause fluorosis.

Soil Erosion

Soil erosion is the movement of top soil from one place to another. Removal of top soil leads to loss in fertility.Soil erosion occurs mainly due to winds or water flow.Overgrazing and mining are responsible forloss of soil. Roots of plants help in binding the soil, thus helping in checking of soil erosion. Plants reduce the wind velocity considerably and transport of lifted sand is checked by trees.Large scale deforestation is not causing only loss of biodiversity but also leading to soil erosion.

Methods of preventing soil erosion

OR

Prevention of loss of topsoil

1. Deforestation should be checked.
2. Afforestation (plantation of trees) should be carried out on large scale. Trees act as wind breaks.
3. Boundaries of fields should be planted with trees in two to three rows.
4. Practices like crop-rotation should be done.

5. Strip cropping should be done on slopping areas of the hill.
6. Suitable irrigation arrangement and drainage system should be made in fields.
7. Grazing should be limited to particular seasons and limited number of animals.
8. Slopes at hills should be divided into number of flat fields to slow down the flowing water by formation of terraces.

Biochemical Cycles

Biochemical cycles are the cyclic pathways through which chemical elements move from environment to organisms and back to-the environment. Such cycling is essential as the earth and its environment, with reference to these elements, are considered as closed system and there is no inflow of such elements from outside the earth and their amounts are limited.

1. Water Cycle

Two types of water cycles:

a) Global water cycle:- It does not involve living organisms and involves the interchange of water between the earth's surface and the atmosphere via the processes of precipitation and evaporation. Ocean is the biggest store house of water. Evaporation involves the conversion of liquid and solid forms of water into vapour and later form the clouds. Precipitation involves the rainfall, hail, snow, etc. Energy for global water cycle is provided by sunlight.

b) *Biological water cycle*:- It is the interchange of water between abiotic and biotic components of environment e.g. the plants absorb water from water bodies and soil while lose most of water by the process of transpiration. Animals consume water from water bodies or the food ingested, while release the water via the processes of respiration and excretion.

Nitrogen Cycle

Significance of nitrogen:- Nitrogen is essential component of amino acids, proteins, enzymes and nucleic acids of the protoplasm.

Source of nitrogen:- Reservoir pool of nitrogen is atmosphere which contains about 78.62% of nitrogen in gaseous state. But it cannot be used directly and is changed into nitrites and nitrates are then utilized.

Four steps of nitrogen cycle

i) Nitrogen fixation:-

It involves the conversion of free diatomic nitrogen (N_2) into nitrites and nitrates. It occurs in three ways:

a) Atmospheric nitrogen fixation in the presence of photochemical and electrochemical reactions induced by thundering and lightening.

b) Industrial nitrogen fixation in the industries at high temperature and high pressure.

c) Biological nitrogen fixation in the presence of certain living organisms e.g.

- Rhizobium bacterium in the root nodules of legumes.
- Azotobacter bacterium in the soil.
- Anabaena (blue green alga) in water in the paddy fields.
- Azospirillum bacterium in loose association with the roots of maize, sorghum, etc.
-

ii) *Ammonification*:-

It involves the decomposition of proteins of dead plants and animals into ammonia in the presence of ammonifying bacteria like Bacillus ramosuns.

iii) *Nitrification*:-

It involves the oxidation of ammonia to nitrites and nitrates in the presence of nitrifying bacteria like Nitrosomonas (Ammonia to nitrite), Nitrobates (Nitrite to

nitrate), etc. Plants absorb the nitrites and nitrates from the soil through their roots and convert them into organic compounds (e.g. proteins) of protoplasm by the process of nitrogen assimilation.

iv) *Denitrification*:-

It involves reduction of ammonium compounds, nitrites and nitrates into molecular nitrogen in the presence of denitrifying bacteria like Thiobacillus denitrificans.

Carbon Cycle

Significance:- carbon is the basic component of all the organic compounds like carbohydrate proteins, lipids, enzymes and nucleic acids of the protoplasm. In atmosphere, it is present as carbon dioxide.

CO_2 utilization:-

Carbon dioxide is utilized by the photosynthetic organisms like green plants, photosynthetic bacteria, diatoms and blue-green algae in the process of photosynthesis. It occurs in the presence of chlorophyll and radiant energy of sunlight. Glucose synthesized by photosynthesis is used to synthesize other organic compounds.

CO_2 Production

i) CO_2 is released during respiration of producers and consumers.

ii) During decomposition of organic compounds of dead bodies.

iii) During burning of fossil fuels like wood, coal, petroleum, etc.

iv) Volcanic eruptions and hot springs.

v) During weathering of rocks by acids produced by micro-organisms and roots of plants.

Oxygen Cycle

Oxygen is present in water and forms 21% of air in atmosphere. All living beings need respiration. Oxygen content of atmosphere has remained constant for last several million years. Most of O_2 lost is replenished by photosynthesis. During photosynthesis CO_2 is used by plants to form food along with release of oxygen. The oxides can be reduced chemically and biologically to produce oxygen. Microbial oxidation can also occur. Due to burning of materials oxygen form carbon dioxide. When oxygen combines with nitrogen, it forms oxides of nitrogen, amino acids, proteins etc. These compounds breakdown to release the oxygen in atmosphere.

Green House Effect

The average global temperature is 15°C which is maintained due to presence of gases like carbon dioxide, methane, water vapour, chlorofluorocarbons. etc. These gases are collectively called heat trapping or greenhouse gases (GHGs). Earth temperature is maintained by reradiated infra (heat) radiations by these GHGs which prevent heat from escaping to outer space. This effect is called greenhouse effect.

Global Warming

Global Warming is the increase in a average global temperature due to increase in amount of Green House Gases in earth's atmosphere.

Consequences of Global warming

i) *Rise in sea level*:- Global warming will melt polar ice caps. If all the ice on earth melts, about 200 feet of water would be added to surface of all oceans. Thus low lying coastal cities like Shanghai, Kolkata, Bangkok, Dhaka, Venice, etc. will be inundated.

ii) *Increase in global temperature:*- If present input trend of Green House Gases continued, the earth's global temperature will rise.

iii) *Effect on agriculture*:- Grain production will be reduced. India's annual monsoon rains may even cease together. One third of global forest might be swept away. Desserts are likely to increase.

iv) Chances of hurricanes, cyclones and floods will be more.

v) Increased temperature and humidity caused by global warming will lead to spread of diseases like malaria, filariasis etc. due to spread of vectors. Incidences of respiratory and skin diseases are likely to increase.

Ozone Layer Depletion And Its ill Effects

Stratospheric Ozone Layer:- Between 20 and 26km above the sea level and situated in the stratosphere, there is an ozone layer . This layer is established due to an equilibrium between photo-dissociation of ozone by UV-radiations and regeneration of ozone. The thickness of this ozonosphere averages 0.29cm above the equator but may exceed 0.40cm above the poles during the winter months.

Significance of Stratospheric ozone layer:- The ozone layer acts as an ozone shield and absorbs the harmful UV-radiations of the sunlight so protects the earth's biota from the harmful effects of strong UV-radiations. So this layer is very important for the survival and existence of life on earth.

Causes of thinning of ozone layer:

The decline in ozone-layer thickness is called ozone hole. Ozone hole is largest over Antarctica. Main chemicals to be responsible for destruction of ozone-layer are: Chlorofluorocarbons (CFCs), halons (used in fire extinguishers), methane and nitrous oxide. Out of these, most damaging is the effect of CFCs which are a group of synthetic chemicals and are used as coolants in refrigerators and air conditioners; as cleaning solvents, propellants and sterilant etc. These CFCs produce "active chlorine" in the presence of UV-radiations. These active chlorine radicals catalytically destroy ozone and convert it into oxygen.

Ill-effects of ozone depletion:- The thinning of ozone layer results in an increase in the

UV radiations reaching the earth's surface. It is estimated that a 5% loss of ozone results in a 10% increase in UV-radiations. These UV-radiations cause:

i) Increased incidence of cataract and skin cancer.

ii) Decrease in the functioning of immune system due to killing of melanin-producing cells of the skin.

iii) Inhibit photosynthesis in most of phytoplankton's so adversely affecting the food chains of aquatic ecosystems.

iv) Damage of nucleic acids of the living organisms.

Ql. *How is our atmosphere different from the atmosphere of Venus & Mars?*

Ans. The multi layered gaseous blanket surrounding the earth is called atmosphere. Atmosphere filters sunlight reaching the earth, affect climate & is a reservoir of several elements which are essential for life.The atmosphere of earth is a mixture of many gases like nitrogen, oxygen, carbon dioxide & water vapour. But in case of Venus & Mars, the major component of atmosphere is CO_2. It constitutes upto 95-97 % of atmosphere on Venus & Mars.

Q2. How does atmosphere act as a blanket?

Ans. The atmosphere act as a blanket as:

i) It keeps the average temperature of earth steady during the day as it reflects the infra red rays back which otherwise can increase the temperature of earth .

ii) During night, it slows down the escape of heat into the outer space.

Q3. What causes winds?

Ans. During the day, the temperature of earth increases due to which the air above the land also gets heated up. As we know that hot air is lighter & has a property to rise up. This heated air also rises up in the atmosphere & displaces the cold air from that region of atmosphere (over the sea) creating a region of low pressure. This displacement of air from one region to the other creates wind.

Q4) How are clouds formed?

Ans. During the day, when water bodies are heated, a large amount of water evaporates & goes into the air. Furthermore, some amount of water-vapour is also released into the atmosphere due to various biological activities like respiration, transpiration etc. The air gets heated up & rises up carrying water vapour with it. Air expands on rising & then cools which causes the water vapour in the air to condense & form tiny droplets. The water droplets get bigger & from clouds.

Q5) List any three human activities that you think would lead to air pollution.

Ans. An increase in the content of harmful substances like Carbon dioxide, Sulphur dioxide, Nitrogen dioxide, Hydrocarbons, Smoke, Dust etc. in air is known as air pollution. The three human activities that we think would lead to air pollution are:

1) Deforestation
2) Combustion of fossil fuels like coal, petroleum etc.
3) Smoke from industries.

Q6) Why do organisms need water?

Ans. Organisms need water because:

1) About 10 % of every cell is composed of water.

2) Water is required to carryout a no. of biological-processes like digestion, transportation of nutrients, excretion & so on.

3) Water acts as universal solvent & helps in transportation of substances in dissolved form from one part of the body to the other.

4) Water is also required to carry out a number of domestic activities like cooking, bathing, agriculture (irrigation) etc.

Q7) *Name some human activities which may pollute a water sources*.

Ans. Some human activities responsible for water pollution are:

1) Addition of some undesirable substances in water like polythene bags, fertilizers, pesticides etc.

2) Disposal of domestic wastes into water bodies.

3) Disposal of industrial wastes like mercury salts (used by paper industry) into water bodies.

Q8) How is soil formed?

Ans. Soil is formed by the weathering of the parent rocks by some physical, chemical or biological agents. The temperature, water, ice, gravity, wind, snow, sun etc. are some of the climatic weathering agents. Chemical weathering consists of chemical decomposition of rocks. Decomposition of parent rocks by micro-organisms, plants or animals is called biological weathering of rocks. As a result of all these types of weathering, rocks are broken down in small particle, called primary soil which is later converted into mature soil.

Q9) What is soil erosion?

Ans. The removal of top layer of soil by wind & rainfall is called soil-erosion. The top-soil is most valuable natural resource because it takes 100 years for 1 cm of top soil to get formed. Some of the factors responsible for soil erosion are:-

1) *Deforestation & over-grazing*:- Both of these activities leave the top-soil bare of vegetation due to which binding force between soil particles decrease. The soil, therefore, can't withstand the impact of wind & water & gets washed away easily.

2) *Soil characteristics:* Soil with low water holding capacity is carried away by wind & water easily.

3) *Climatic Factors*: These include humidity , rainfall, temperature, winds.

Q10) What are the methods of preventing soil erosion?

Ans. The methods of preventing soil erosion are:-

1) *Aforestation*: - More & more plants should be grown because the roots of plants bind the soil particles together & prevent them from being carried away by strong winds & water.

2) *Overgrazing* by animals should be checked.

3) *Bunds* should be built to check the flow of water.

4) *Terrace farming* should be done in hilly areas.

5) *Proper leveling* of the land should be done so that water may be drained out easily.

Qll) What are the different states in which water is found during the water cycle?

Ans. During the water cycle, water is found in solid (ice), liquid (water) & gaseous (vapour) states.

Q12) List any three activities which would lead to an increase in the CO_2 content in the air.

Ans. The three activities which would lead to an increase in the CO_2 content in the air are:-

1) *Deforestation*: Due to cutting down of trees on large scale, the CO_2 released during respiration by all organisms will remain unused thus leading to increase in the concentration of CO_2.

2) Burning of fossil fuels like petroleum in automobiles & industries release a large amount CO_2 into the atmosphere.

3) Burning of charcoal & coal for carrying out a no. of domestic activities.

Q13) What are the two forms of oxygen found in atmosphere?

Ans. Molecular oxygen i.e. a diatomic molecule having two oxygen-atoms and Ozone i.e. a triatomic molecule having three oxygen atoms.

Q14) What is green-house effect?

Ans. An increase in the earth's temperature due to an increase in the CO_2 concentration is known as green-house effect. CO_2 in the atmosphere prevents the heat radiations reflected by the earth from escaping into the outer space causing a rise in the temperature of earth.

Q#15 *How are living organisms dependent on the soil? Are living organisms in water totally independent of soil as a resource?*

Ans. Almost all living organisms are dependent on plants directly or indirectly because plants are producers in the food chain or we can say that without plants, food chain is

incomplete. Since plants grow in the soil, living organisms are dependent on the soil. Furthermore, terrestrial organisms are directly dependent on soil because for them soil acts as a medium for their survival.

Organisms that live in water are not totally independent of soil as a resource because many nutrients present in the soil flow in the water via rain in the water bodies which are necessary for these organisms.

Q16) You have seen weather reports on T.V & in newspapers. How do you think we are able to predict weather?

Ans. Weather can be predicted by studying wind patterns i.e. from where winds will originate & where they will stop. It is the wind patterns that decide the pattern of rainfall. This pattern also shows areas of low pressure & high pressure. In India, rains are mostly brought by South-West or North-East monsoons.

Q17) Why is atmosphere essential for life?

Ans. Atmosphere is essential for life in following ways:-

1) One of the components of atmosphere is O_2 & this O_2 is used by all living organisms in the process of respiration for oxidation of food to release energy.

2) Another component of atmosphere i.e. CO_2 acts as a raw-material for plants in the process of photosynthesis.

3) The ozone-layer of atmosphere acts as a shield & protects the living organisms from the harmful effects of U.V radiations emitted by sun by absorbing them.

4) Atmospheric air regulates the temperature of the earth & keeps it at a level at which life could be sustained.

5) Atmosphere (air) acts as a medium for sound waves to travel from one place to another therefore enable us to communicate.

Q18) Write a note on how forests influence the quality of our, soil & water resources.

Ans. i) Forests play a vital role in the recycling of air. Forests consists of large no' of trees, shrubs & herbs. They take in CO_2 & release O_2 during photosynthesis. This

demand is fulfilled by forests.

ii) The roots of trees & plants bind the soil particles firmly. They form a vegetation cover over the fertile top soil. Thus, they prevent the removal of top soil & hence prevent soil erosion.

iii) Forests give out enormous amount of water in the form of water vapour into the atmosphere through transpiration. This water vapour helps in the formation of clouds which on precipitation cause rain. If forests are cut & not replenished, there will be reduction in the rainfall & hence the water-level of various bodies present on earth will fall.

Q19) What is global warming?

Ans. An increase in the concentration, of CO_2 in the atmosphere is found to increase the temperature of the earth. A subsequent rise in temperature is likely to disturb the earth's delicate thermal balance which may cause several adverse changes in the climate. An increase in earth's temperature would result in the melting of glaciers raising the sea level & causing flood in the coastal areas. There would be rapid water evaporation causing an increase in the concentration of water vapour in the atmosphere.

Topic: Is Matter Around Us Pure

Pure substance: It may be defined as a substance which contains only one kind of atoms or molecules. Pure substance is throughout same because it consists of only one kind of particles. These particles are similar to one another and can't be separated into simpler particles by any physical process. All elements and compounds are pure substance (H_2, C_2 , O_2 etc)

Impure substance: They may be defined as the substances which contain two or more different kinds of particles which are not combined chemically but are mixed together in a variable proportion. They have a variable composition and no definite formula can be given to the impure substances.

Elements: Robert Boyl was the first scientist who used the term element in 1961. An element is defined

as the simplest form of substance that contains only one kind of atoms which are same in all respect (size, shape, mass etc.) However atoms of different elements are different from one another. Elements are found to exist in all the states of matter i.e solid, liquid and gas.

Example of solid elements: Sodium. Potassium, and Gold.

Example of liquid elements: Mercury, Bromine.

Example of gaseous elements: Hydrogen, oxygen, and nitrogen

Classification of elements based on physical and chemical properties:

On the basis on physical properties elements have been classified into three types: Metals, Non Metals, and metalloids.

Properties of metals:

i) These are lustrous i.e. they have a shiny appearance.

ii) These are malleable i.e they can be hammered or beaten to form thin sheets without breaking.

iii) These are ductile i.e they can be drawn into thin wires.

iv) These are good conductors of heat and electricity.

v) These are generally hard but hardness varies from one metal to other.

vi) These have a high tensile strength i.e. they can withstand large force without breaking

vii) These generally have high melting and boiling points.

viii) These generally have high densities.

ix) These are sonorous. i.e they make a ringing sound when hit.

Metalloid:

Elements which have properties in between those of metals and non-metals are called as metalloids. These elements show some properties of metal and some properties of non-metals e.g. silicon, germanium.

Physical properties of non-metals:

1. They have dull appearance.

2 . They are non-ductile.

3. They are non malleable but are brittle i.e they break easily.

4. They are bad conductors of heat and electricity.

5. They are generally soft except diamond which is extremely hard.

6. They are not strong.

7. They have low densities.

8. They have comparatively low melting and boiling points.

9. They are not sonorous.

Mixture:

It is a material which consists of two or more pure substances which are not chemically combined but are physically mixed in any proportion e.g. sea water, air etc.

Types of mixtures:

1) Homogeneous mixture: A mixture is said to be a homogeneous if all the components of mixture are mixed uniformly and there are no boundaries of separation between them. In other words a homogeneous mixture consists of only

one phase e.g. air, alloys etc.

2) Heterogeneous mixture: A mixture is said to be heterogeneous if all the components of mixture are not thoroughly mixed and there are visible boundaries of separations between them. It does not have a uniform composition throughout e.g. a mixture of sugar and sand, mixture of oil and water.

Physical properties of mixture:

1) It may be homogeneous or heterogeneous.
2) Its composition is variable.
3) It does not have a definite melting and boiling point.
4) Energy is neither absorbed nor evolved during the formation of mixture.
5) The components of mixture can be separated by simple physical methods.
6) The properties of mixture are the properties of its constituents.

Compounds: - It is defined as pure substance made up of two or more elements chemically combined in a fixed ratio by mass e.g. H_2O, CO_2, etc.

Properties of compound:

1. It is always made up of same elements combined together in a fixed ratio by mass.
2. It has a definite molecular formula and a fixed melting and boiling points.
3. Energy in the form of heat or light is usually evolved or absorbed during the formation of compounds.
4. It cannot be separated into its components by the simple physical methods.
5. The properties of a compound are entirely different from its components.
6. Compound is always a homogeneous substance.

Physical changes:

The changes in which only physical properties of the substance change but no new substances are formed are called physical changes. During physical changes the substances do not change their identity but only some physical properties such as

physical state, shape and size changes. These physical changes can be reversed easily e.g. melting of ice, preparation of solution.

Chemical changes:

Those changes in which new substances are formed are called as chemical changes.

During a chemical change, chemical properties, and chemical composition of the substance is changed.

The substance loses its identity and gets converted into entirely different substances.

The chemical changes are permanent or irreversible, i.e. burning of paper, rusting of iron.

Solution:

It is defined as a homogeneous mixture of two or more chemically non reacting substances whose composition can be varied within limits. If a mixture is to be called solution, it must satisfy the following two conditions:

1. The components should be non- reacting.
2. Mixture should be homogenous.

True solution: Solution is said to be a true solution if the solute particles are so thoroughly mixed with the solvent that we cannot distinguish them from one another.

Aqueous solution: A solution in which H_2O acts as a solvent is called as an aqueous solution e.g. solution of common salt and H_2O.

Non-aqueous solution: A solution in which solvent is other than H_2O is called as non aqueous solution e.g. solution of iodine in alcohol.

Components of the solution:

1. Solute: The component of the solution which is present in small amount is called a solute.
2. Solvent: The components of solution which is present in large amount is called solvent.

Types of solution:

Solid solutions: In solid solutions , solvent is a solid while as solute can be either solid, liquid or gas e.g

Alloys, hydrated salt.

Liquid solution: in a liquid solution, solvent is a liquid while solute can be either a solid, liquid or a gas e.g. a solution of alcohol in H_2O, solution of sugar in H_2O aerated drinks.

Gaseous solution: In gaseous solution solvent is a gas while solute can be either solid, liquid or gas e.g. air,

clouds etc.

Name of solution	**Solute**	**Solvent**	**Examples**
Solid Solutions			
i) Solid in solid	Solid	Solid	Alloys
ii) Liquid in solid	Liquid	Solid	Hydratedsalts
iii) Gas in solid	Gas	Solid	Gas adsorbed on metal surface
Liquid Solutions			
i) Liquid in liquid	Liquid	Liquid	Vinegar sol
ii) Solid in liquid	Solid	Liquid	sugar sol
iii) Gas in liquid	Gas	Liquid	Aerated drinks
Gases solution			
i) Solid in gas	Solid	Gas	Iodine in air
ii) Liquid in gas	Liquid	Gas	Clouds, fog
iii) Gas in gas	Gas	Gas	Air

Properties of solution:

1) It is a homogenous mixture.
2) The components of a solution do not chemically react with one another.
3) A solution may be coloured or colourless.
4) The particles of solution are smaller than 1nm in diameter. So, they can't be seen by naked eyes or

'. even under a microscope.

5) The solute particles do not scatter a beam of light passing through the solution. Therefore, the path of light is not visible in a solution.
6) The solute particles of a solution pass through the filter paper, thereby, showing that they are smaller
   than the pores of filter paper.
7) When the solution is allowed to stand undisturbed, the solute particles do not settle down. This shows that the solutions are stable.

Concentration of a solution*:*

It is the amount of the solute present in a given solution. The solution having small amount of solute is said to have a low concentration and is known as dilute solution. The one having large amount of solute is said to have high concentration and is known as concentrated solution. The most common way of expressing concentration of solution is the percentage method and can he expressed in a different ways:

i) Mass% ii) Mass%

Mass Volume

Formulas:

$$\text{Concentration of solution} = \frac{\text{Mass of solute}}{\text{Mass of solution}} \times 100$$

Concentration of solution $= \frac{\text{Mass of Solute}}{\text{Volume of sol.}} \times 100$

1) *Calculate the concentration of a solution if it contains 10gm of solute and 90gms of solvent.*

Sol: Mass of solute = l0 gm

Mass of solvent = 90gm

Mass of solution = 10 + 90

= l00gm

Concentration of solution = $\frac{\text{Mass of the solute}}{\text{Mass of solution}} \times 100$

= 10/100x100

= 10%

2) *If 110g of salt in present in 550g of solution. Calculate the concentration.*

Sol: Mass of solute = l10g

Mass of solution = 550gms

∴ Concentration of solution = $\frac{\text{Mass of solute}}{\text{Mass of solution}} \times 100$

= 110/550x100

= 20%

3. A solution contains 50ml of alcohol mixed with 150ml of water. Find its concentration.

Sol: Volume of solute = 50 ml

Volume of solvent = 150 ml

Volume of solution = 150ml + 50ml

= 200ml

$$\text{Concentration of solution} = \frac{\text{Volume of solute}}{\text{Volume of solution}} \times 100$$

$$= 50/200 \times 100 = 25\%$$

***Solubility*:**

The maximum amount of solute in grams which can be dissolved in l00gm of solvent at a given temperature to form a saturated solution is called the solubility of the solute in that solvent at a particular temperature.

Effects of temperature and pressure on solubility:

The solubility of solids in liquids usually increases on increasing in temperature and decreases on decreasing the temperature.

The solubility of solids in liquids remains unaffected by the change in pressure.

The solubility of gases in liquids usually decreases on increasing the temperature and vice versa.

The solubility of gases in liquids increases on increasing the pressure and decreases on decreasing the pressure.

***Saturated solution*:** A solution which contains the maximum amount of solute dissolved in a given quantity of solvent at a given temperature and which cannot dissolve any more solute at that temperature is called saturated solution.

Unsaturated solution:

A solution in which more quantity of solute can be dissolved without raising its temperature is called unsaturated solution.

Super Saturated Solution:

A solution which temporarily contains more solute than the saturation level at a particular temperature is called super saturated solution.

Effects of heating or cooling on saturated solution:

1. If the saturated solution is heated it becomes unsaturated because the solubility of solute increases on heating and more of the solute can be dissolved on raising the temperature of the solution.
2. If the saturated solution is cooled then some of its dissolved solute will separate out in the form of solid crystals because the solubility of solute decreases on cooling.

Suspension:

It is a heterogeneous mixture in which the solute particles do not dissolve but remain suspended throughout the bulk of the medium e.g. suspension of calcium hydroxide in water etc.

Properties of suspension:

1. It is a heterogeneous mixture.
2. The solid particles of a suspension are so large that they are visible to the naked eye.
3. The particles of a suspension scatter a beam of light passing through it and make its path visible.
4. Suspensions are unstable. The solid particles of a suspension settle down when it is allowed to stand undisturbed for some time.
5. The particles of a suspension cannot pass through a filter paper.
6. Suspensions are either opaque or translucent.

Colloidal Solution*:*

Solution in which the size of particle lies in between those of true solution and suspension are called colloidal solution or colloides.

Properties of collides:

1. It is a heterogeneous mixture consisting of two phases called dispersed phase and dispersion medium.

2. These are stable.
3. The size of colloidal particles lie between those of true solution and suspensions.
4. When colloidal solutions are placed under an ultra microscope the particles are seen to be
   continuously moving in a zig-zag path which is called
   Brownian motion.
5. The colloidal particles are big to scatter light passing through them which makes the path of light visible. This scattering of beam of light by colloidal particles is called as Tyndall effect.
6. The particles carry charge.

Dispersed phase	Dispersion medium	Type	Example
Solid	Solid	Solid sol.	Coloured gem stones
Solid	Liquid	**	Muddy H2O, paints
Solid	Gas	Solid aerosol	Smoke, dust, storm
Liquid	Solid	Gel emulsion	Telly, cheese
Liquid	Liquid	Aerosol	Milk , face cream
Liquid	Gas	Solid foam	Fog, clouds, sprays Pumice stones, rubber
Gas	Solid	Foam	Soap, lather, shaving cream
Gas	Liquid		

Dispersed Phase:

The solute like component which has been dispersed throughout in a solvent like

medium is called dispersed phase.

Dispersion medium:

The solvent like medium in which the dispersed phase has been distributed is called the dispersion medium.

Emulsion:

It is a type of solution in which the dispersed phase as well as dispersion medium is a liquid e.g. milk etc.

Types of emulsion:

Oil in water emulsions: In these emulsions oil is the dispersed phase and water is dispersion medium.

Water in oil emulsions: In these emulsions water is the dispersed phase and oil is dispersion medium.

Emulsifiers:

The substances which are added to stabilize emulsions are called emulsifiers. They stabilize emulsions by reducing the surface tension of water.

Techniques of separation:

Evaporation:-

This is the method used to separate non-volatile components (solutes) that are dissolved in volatile solvents. In this method, we heat a homogeneous mixture which leads to the evaporation of solvents leaving behind the

Non- volatile solute. For example this technique is used on a commercial scale to obtain common salt from sea water or lakes containing common salt.

Centrifugation:

Sometimes the solid particles in liquid mixture are very small and thus easily pass through filter paper. Therefore, such particles can't be separated by filtration technique. Such mixtures can be easily separated by the technique of centrifugation. This technique is based upon a principle that when the mixture is rotated at high

speed, the lighter particles stay on the surface of liquid while the heavier particles are forced to the bottom of liquid. The machine used to carry out the process of centrifugation is called centrifuge e.g. when milk is rotated at high speed in centrifuge the lighter fat particles come to the surface in the form of cream, while the heavier particles of milk are forced to come to the bottom. As the result separation occurs, the cream is collected at the outlet provided near the top of centrifuge. While the milk is collected through the outlet provided near the bottom of the machine.

Applications of centrifugation technique:

1.This technique is used in diagnostic laboratories for blood and urine tests.

2.It is used in dairies and homes to separate butter from cream.

2. Centrifugation technique is also used in washing machines to squeeze out water from wet clothes.

Miscible liquids:

The pair of liquids which mix well with each other are called miscible liquids.

Immiscible liquids:

The pair of liquids which do not mix with each other are called immiscible liquids it.

Separation using a separating funnel:

This method is used to separate two immiscible liquids. These liquids form a heterogeneous mixture and they can be separated it to constituents by using separating funnel. This technique is based upon the principle that when a mixture of two immiscible liquids is allowed to stand, they separate out into two separate layers depending upon their densities e.g. mixture of kerosene oil and water is separated using this technique. We pour the mixture of kerosene and water in a separating funnel. It is allowed to stand for sometime so that two separate layers are formed. The kerosene oil being lighter than water forms the upper layer while the water being heavier forms lower layer. The boundary of separation of two liquids is clearly visible. Now place the beaker beneath the funnel and open stop cock. The lower

layer of water is run out carefully. Close the stop cock as soon as the oil layer reaches the stop cock. Now remove the breaker containing water and replace it by another beaker. Once again open the stop cock and pour out the upper kerosene oil layer.

Applications of this technique:

It is used to separate the mixture of two immiscible liquids like benzene and water, chloroform and water, ether and water.

***Sublimation*:-**

The process of sublimation is used to separate sublime volatile components from the non-volatile components of a mixture. Example a mixture containing ammonium chloride and common salt is separated by this technique.

***Crystallization*:**

Crystals are the purest form of substance having definite geometrical shapes. The process by which an impure compound is converted into its crystals is known as crystallization. This process is based upon the principle that when a crystal is formed, it tends to exclude the impurities which remain in the solution e.g. if we take about 5gms of impure copper sulphate and dissolve it in a minimum amount of water in a China dish.The solution is then filtered to remove insoluble and suspended impurities. Then the filtrate is evaporated in a China dish so as to get a saturated solution. 'The hot saturated solution is allowed to stand undisturbed for few hours due to which crystals of pure copper sulphate separate out. These crystals are separated by filtration through an ordinary funnel and the filtrate left after the separation of crystals is called as mother liquor.

Applications of crystallization:

1. It is used to obtain pure salts from the impure samples.
2. The salt we get from sea water contains a number of impurities. To remove these impurities process of crystallization is used.

Advantages of crystallization over evaporation:

During evaporation, the solution is heated to dryness. During this treatment some solids get decomposed.

When the solution is evaporated, the impurities get deposited along with the solid and thus contaminate the solid. In contrast when the solution is allowed to stand for crystallization, crystals of pure solid separate out leaving behind impurities in the solution.

***Chromatography*:**

It is most modern and versatile method used for the separation, purification and testing the purity of inorganic and organic compounds. It was discovered by a Russian botanist in 1906 named as TS Wett.

Types of chromatography:

i) Column chromatography
ii) Thin layer chromatography
iii) Gas liquid chromatography
iv) High performance liquid chromatography
v) Paper chromatography

Principle of chromatography:

We know that two or more substances may be soluble in the same solvent but their solubilities are usually different. Thus, when a solvent is allowed to pass over mixture of such substances, the substance which is more soluble in solvent moves faster and thus gets separated from oilier substances in mixture which moves slowly. Thus separation of different components of mixture by chromatography is based upon their different solubility in the same solvent.

Applications of the Chromatography:

1. It is used to monitor the progress of a reaction.
2. *It* is used to separate different colored substances present in dyes and natural

pigments.

3. It is used to separate and identify the amino acids obtained by hydrolysis of proteins.
4. It is used to detect and identify drugs present in the blood of criminals in forensic science.

Distillation:

It involves conversion of liquid into vapours by heating followed by condensation of vapours thus produced by cooling.It is used for the separation of components of a mixture containing two miscible liquids which boil without decomposition and have sufficient difference in their boiling points.

Principle of distillation:

The separation is based upon the principle that at the boiling point of more volatile liquid of mixture, the vapours almost exclusively consists of the more volatile liquid. Likewise at the boiling point of less volatile liquid, the vapours almost consist of less volatile liquid since the more volatile liquid has distilled already over. Thus the separation of liquid mixture into individual components can be achieved at their respective boiling points. The more volatile component distills first while the less volatile component gets distilled over afterwards.

Applications of distillation:

It is used to separate the mixture of two miscible liquids e.g. ether and toluene, benzene and toluene etc.

Fractional distillation:

If the boiling points of two miscible liquids of the mixture are very close to one another, the separation can't be achieved by simple distillation method. This is due to the reason that at the boiling point of the more volatile liquid of the mixture there will be sufficient vapours of the less volatile liquid as well. As a result, both the liquids of the mixture will distill together and their separation can't be achieved. The separation of such a liquid mixture into individual components can achieved by

fractional distillation which involves repeated distillations and condensations. Distillation is carried out using a fractionating column.

Fractional distillation of air:

Air is a homogeneous mixture of many gases which can be separated by fractional distillation. Air is cooled and compressed by applying pressure and decreasing temperature. Air is compressed to form liquid air called liquefied air liquid. Air is subjected to fractional distillation and different gases are separated according to their boiling points.

Topic: Structure of atom

Discovery of electron,study of cathode rays ,discharge tube experiments:

The existence of electron in an atom was shown by J..J. Thomson in 1897 on the basis of detailed study of

cathode rays. The discovery of cathode rays was made on the basis ofdischarge tube experiments using airor some other gases inside the discharge tube.

Discharge Tube: It is a long glass tube. Two circular metal plates A and B are sealed at the two ends or tube. These plates are called electrodes. A side tube is also fused to the tube which can be connected to a vacuum pump to suck out the air or gas present inside the tube to reduce the pressure inside the tube.

Production of Cathode Rays: On applying high voltage (about 10,000 volts) between the electrodes, the results observed at different pressures of the air or gas inside the tube is as follows:

No flow Of Current At Ordinary Pressure: When the air inside the discharge tube is taken at normal atmospheric pressure and a voltage of about 10,000 volts is applied between the electrodes, no current flows through the air between the electrodes. This is because air or any gas at normal pressure is a poor conductor of electricity.

Glow In The Entire Tube At 1mm Pressure: If the air inside the tube is sucked out by connecting the side tube "S" to the vacuum pump so that the pressure falls to about 1 mm of mercury and now a voltage of about 10,000 volts is applied, the current begins to flow between the electrodes through the air inside and hence the entire discharge tube begins to glow uniformly with magenta red colour.

1) Glow Intercepted By Dark Bands At Lower Pressures: If the air inside the tube is sucked out so that pressure inside the tube further falls and high voltage is applied as before, the glow is intercepted by dark bands at the right angle to the axis of the tube.

2) *Production Of Cathode Rays at 0.001mm Pressure*: When the pressure of the air or the gas inside in the tube falls to about 0.00 I mm, the discharge tube appears dark i.e. there is no light emitted by the air. However, the glass wall of the tube exactly opposite to the cathode glows with a greenish-yellow light called fluorescence. This observation clearly shows that some invisible rays are coming iron from thecathode which travel in straight line and strike the glass wall opposite to the cathode. Since, these rayswere coming from cathode, these are called cathode rays.

Properties of Cathode Rays:

i) *Cathode rays travel in straight lines:* This is shown by the fact that if an object such as metal cross is placed in the path of cathode rays, they cast a sharpshadow of the object at the back.

ii) *Cathode rays are made up of material particles:*This is shown by the fact that if a light paddle wheel isplaced in the path of cathode rays such that the cathode rays strike the blades of upper half, it begins torotate.

iii) Similarly, when a magnetic field is applied on the cathode rays, they are deflected in a direction which shows that they carry negative charge. They produce green fluorescence on the glass walls of the discharge tube as well as on certainsubstances such as zinc sulphide.

iv) Cathode rays produce heating effect.

v) They produce X-rays when they strike against the surface of hard metals like tungsten etc.

Electrons: The negatively charged material particles consisting of the cathode rays are called electrons. Charge on an electron is -1 unit.

Mass on an electron is negligible. 9.1×10^{-31}kg

$1/1840^{th}$ of mass of hydrogen

Origin of Cathode Rays: The cathode rays are firstproduced from the material of the cathode.These then hit the gas atoms present in the discharge tube and knock out electrons (from the gas atoms). These electrons travel towards the opposite charged anode in the form of cathode rays.

Production Of Anode Rays: Since the atom as a whole is electrically neutral and the presence of negatively charged electrons in it has been confirmed beyond doubt.Therefore, it was thought that some positively charged particles must also be present in the atom. The existence of positively charged particles in an atom was shown by Goldstein in 1886. He took a discharge tube with a perforated cathode and a gas at low pressure inside the discharge tube. On applying high voltage, between the anode and the cathode, it is observed that just fluorescence was observed on glass wall of the tube at E due to cathode rays coming from the cathode, and hit the wall at E. Fluorescence is also observed on the glass wall of the tube at F. This shows that some rays coming from the side of the anode which passed through the holes in the cathode and then strike the glass of the tube at F. Since, these rays are coming from the side of the anode, therefore, they are called anode rays. They are also named as "canal rays" because they passed through the holes or canals in the

cathode. Further, their deflection in the electric field shows that they carry positive charge. Hence they are also called "positive rays".

Origin Of Anode Rays: Anode rays do not originate from the anode. They are produced in the space between the anode and the cathode. It is believed that the high electrical energy supplied between the electrodes splits up molecules of the gas present in the tube into atoms. The electrons present in these atoms further absorb electrical energy and are knocked out. The electrons thus knocked out travel towards anode and form a part of cathode rays. The remaining part of the atom becomes positively charged particle. These positively charged particles travel in the form of a stream towards the cathode (because it is a negatively charged electrode) and constitute anode rays.

Properties Of Anode rays:

The properties of anode rays have been studied by experiments similar to those of cathode rays. The main properties of anode rays are:

1) *Theytravel in straight lines:* This is shown by the fact that if an object is placed in their path, a shadow is produced at the back. However, their speed is much less than that of the cathode rays.
2) *They are made up of material particles*: This is shown by the fact that if a light paddle wheel mounted on an axle is placed in their path, it begins to rotate.
3) *They carry positively charge*: It is observed that the anode rays are deflected towards the negative plate of the electric field and produce fluorescence at 'F'. This shows that they carry positive charge. Mass of positively charged particles constituting the anode rays also depends upon the nature of the gas. The mass is found to be nearly equal to the mass of the atom of the gas.
4) Charge on the positively charged particles constituting the anode rays is also found to depend upon the nature of the gas and the voltage applied. However, the charge is found to be a whole number multiple of the charge present on the electron. It may be +1, +2, +3 units depending upon the number of electrons knocked out of the gaseous atom.

Q) What is a proton?

A) A proton is defined as the sub-atomic or fundamental particles which carries one unit positive charge and has mass nearly equal to that of hydrogen atom.

Charge on proton = +1. It is represented by the symbol p, mass of proton is 1.67×10^{-27}.

Bohr's Model of Atom:

In order to overcome the drawbacks of Rutherford's model of the atom, Neil Bohr put forward a new model of atom in 1913. Its main postulates are:

1. An electron in an atom revolves around the nucleus only in a definite circular orbits. These orbits are associated with definite amounts of energies and are called energy shells or levels. These are numbered as 1, 2, 3, 4.....and designated as K , L , M , N.....
2. As long as electron remains in a particular orbit, it neither gains nor looses energy. These orbits are therefore called stationary states.
3. The angular momentum of an electron revolving around the nucleus is fixed (quantized) and is equal to

$$mvr = \frac{nh}{2\Pi}$$

where m is mass of electron, v is the velocity of electron.
ris radius of orbit, h is Planks constant and 6.626×10^{-34}
Energy is absorbed or emitted only when the electron changes its state.

4. Energy is absorbed or emitted only when the electron

jumps from one orbit to another i.e. from ground state to excited state. The energy emitted or absorbed is given by

$$\Delta E = E2 - E1 = Hv$$

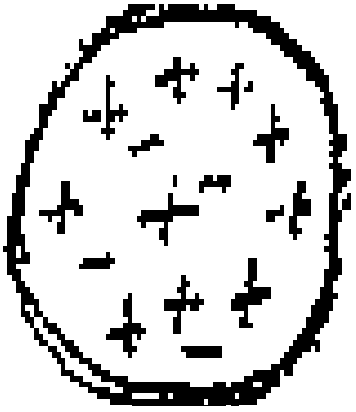
$$V = \frac{E2 - E1}{\text{----------}}$$ Equation for frequency of emitted radiation

WhereΔE is Change in energy
$E_2$is Level having higher energy. $E_1$is Level having lower energy.

Usefulness Of Bohr's Model Of Atom

According to Bohr's Model, as electrons cannot radiate energy while revolving in discrete orbits, therefore, it explains the stability of the atom i.e. it explains drawback of Rutherford's model of atom.

Thomson's Model of an Atom: In 1909. J.J. Thomson proposed that an atom is like a positive sphere in which electron are embedded that are sufficient to neutralize the positive charge. This maybe compared with a watermelon in which seeds are embedded. This model of an atom is called Thomson's Model. However, it could not explain the results of scattering experiments carried out by the Rutherford in 1911 and hence was rejected.



Rutherford's Model of the Atom:

Rutherford in 1911, performed some experiments in which he bombarded a thin foil of a heavy metal like gold with a beam of fast moving alpha particles which aredoubly charged helium ions (He2+) each having two units of a positive charge and four units of mass (4u). These were obtained from radium placed in the cavity of a block of lead and made into a fine beam with a slit . He observed the scattering of the alpha-rays after hitting the foil by placing a circular zinc sulphide screen around the metal foil. Wherever alpha particles strike the screen, a flash of light is produced at that point on the screen.

Observations:

1. Most of the alpha-particles (99.0%) passed straight through the foil without undergoing any deflection.
2. Some of the alpha-particles were deflected through small angles and a few were deflected through large angles.
3. Very few only one in 12000 were deflected back.

Conclusions: From the α-particle scattering experiment Rutherford concluded that:

1. Most of the space inside the atom is empty because most of the α-particles passed straight through the gold foil without getting deflected.
2. A nucleus is present at the centre of an atom which is positively charged because few of the α-particles were deflected or rebounded back.
3. The size of nucleus is very small as compared to the total volume of atom because very few α-particles were deflected.
4. Whole mass of atom (atomic mass) is concentrated in the nucleus.

On the basis of his experiment, Rutherford put forward his model of atom which stated that:

1. There is a positively charged centre in an atom called the nucleus.

Nearly whole mass of atom is concentrated in the centre.

2. The electrons revolve around the nucleus in well-defined orbits.
3. The size of the nucleus is very small as compared to the size of the atom.

Final model given By RutherfordAbout Atoms:

On thebasis of scattering experiments, Rutherford put forward a model of atom known as Rutherford's nuclear model. The main points are as follows:

1. An atom consists of two parts: a) nucleus b) extra nuclear part.
2. Nucleus is a small heavy positively charged body present in the centre of the atom.
3. Extra nuclear part means the space around the nucleus in which electrons are present.
4. The entire mass of the atom is concentrated in the nucleus. Since the electrons have negligible mass.
   The mass of the atom is mainly due to the protons.
5. Toexplain that the electrons do not fall into the nucleus as a result ofattraction. Rutherford suggested

that electrons were not stationary but were revolving around the nucleus in certain orbits. As a result,

centrifugal force comes into play which balances the force ofattraction.

Drawbacks of Rutherford's model of the atom:

Rutherford could not explain the stability of an atom. This is because according to the Rutherford's model, an atom consists of a small heavy positively charged nucleus in the centre and the electrons were revolving around it. However, when a charged particle like electron is revolving around a central force like that of nucleus, it loses energy continuously in the form of radiations. Thus, the orbit of the revolving electron will keep on becoming smaller and smaller, following a spiral path and ultimately the electron should fall into the nucleus. In other words, the atom should collapse. However, this actually doesn't happen and the atom is quite stable.

Discovery of Neutron: Reason for the discovery of neutrons in an atom: The mass that was calculated after the number of protons was found to be less than the actual mass of atom. So, it was suggested by Rutherford in 1920 that there must be some neutral particles with definite mass present in the nucleus.

Experimentsleading to the discovery of neutron: The existence of neutron in the nucleus was confirmed by Chadwick in 1932. He bombarded the nuclei of some light elements like Beryllium and Boron with fast

moving α-particles. He found that some neutral particles were ejected from

the nucleus. Each of these particles carries no charge but had a mass nearly equal to that of proton (1.67 x l0^{-27} kg). This particle was named as neutron.

Neutron:

It may be defined as that sub atomic particle which carries no charge, i.e. neutral particle having mass nearly equal to that of the proton.

Composition of Atom

Electron:

Charge -ve(-1.602 x 10^{-19}coloumb)

Mass= 9.l x 10^{-31}kg

Location→ extra nuclear part

Symbol→$^{0}e_{-1}$

Proton:

Charge:

+ve(1.602 x 10^{-19}coloumb)

Mass: 1.673 x 10^{-27} kg

Location : Nucleus

Symbol: $^{1}p_{1}$

Neutron:

Charge: No charge

Mass: 1.675 x 10^{-27} kg

Location: Nucleus

Symbol: $^{1}_{0}n$

Atomic Number:

It is equal to the number of protons present in the nucleus of the atom of an element or no. of electrons in the extra nuclear part. Itis denoted by Z

Characteristics of Atomic Number:

1. It is always a whole number.
2. All the atoms ofthe same element have same numberof protons in the nucleus and hence have the sameatomic number.
3. No two elements have the same atomic number.
4. It does not change during the chemical reaction.

MassNumber: It is the sum ofthe number of protons and neutrons present in the atom of an element.

Massnumber = Number of protons + number of neutrons. It is denoted by A.

1. **<u>Distribution of electrons in different shells/Electronic Configuration of Elements:</u>**
   a. Thedistribution or arrangement ofthe electrons in the different shells ofthe atom is called the electronic configuration of the

element.

b. To write the electronic configuration of an element, we should know the following:

i) Total number of electrons present in the atom.This is equal to the number of protons (i.e. atomic number) for a neutral atom.

ii) Maximum number of electrons that can be present in each shell of the atom. This is given by BohrBury Scheme as follows:

The maximum number of electrons that can be present in the nth shell is equal to $2n^2$. Thus we have

Shell	Maximum Number of electrons present
I shell or K-shell (n- 1)	$2 \times 1^2 = 2$
II shell or L-shell (n- 2)	$2 \times 2^2 = 8$
III shell or M-shell (n- 3)	$2 \times 3^2 = 18$
IV shell or N-shell (n-4)	$2 \times 4^2 = 32$

ii. The outermost shell cannot have more than eight electrons even if the first rule is violated e.g. III shell (M-Shell) can accommodate upto 18 electrons but as soon as it has acquired 8 electrons, the filling ofthe IV shell (N-Shell) starts. Thus, for the first 18 elements, rule (iii) can be applied.

iii. Electrons do not enter into a new shell unless the inner shells are completely filled. In other words, the shells are filled in a stepwise manner.

ValenceElectrons AndValency

1. The electrons present in the outermost shell ofthe atom of an element are called valence electrons.Theoutermost shell is called the valence shell.
2. The number of electrons gained, lost or shared by the atom of an element so as to complete its octet (or duplet in case of elements having only K-shell) is called the valency ofthe element.
3. Calculation Of Valency:

1. For elements having valence electrons 1, 2 or 3 valency is equal to the number of valence electrons.
2. For elements having valence electrons 4,5,6 or 7, valency is equal to the number of electrons to be added so that the valence shell has 8 electrons.
   Valency=8-(number of valence electrons).
3. For noble gases, valency is zero: This is because they are chemically inert i.e. they do not take part in the reaction. Noble gases have 8 valence electrons .

Isotopes:
Atoms of an element having the same atomic nobut different mass numbers are known as isotopes of that element. For example:

i) $_6C^{12}$ and $_6C^{14}$
ii) $_{17}C^{35}$ and $_{17}C^{37}$
iii) $_1H^1$ and $_1H^2$ or $_1H^3$

Chlorine occurs in two isotopic forms in nature, with masses 35u and 37u in the ratio of 3: 1.The average atomic mass of Cl-atom is:
Ratio: 75/100 and 1/100
=35x(75/100) +37x(25/100)
105 + 37 = 142
----- --- ----- = 35.5u
4 4 4
Average mass of chlorine is 35.5u

General Characteristics of Isotopes:

1. Same atomic number i.e. number of protons=number of electrons.
2 Different mass number/number of neutrons.
3 Same chemical properties.
4. Different physical properties
5 Different nuclear properties

Uses / Applications of Isotopes:
Some important uses ofisotopes are:

1. An isotope of uranium (U_{235}) is used as fuel in nuclear reactors to produce energy.
2. An isotope of carbon (C-14) is used to determine the age of old and dead objects.
3. An isotope of cobalt is used in the treatment of cancer.
4. An isotope of iodine is used in the treatment of goitre.

Types of Isotopes:

i) *Radioactive isotopes*: These isotopes are unstable and spontaneously breakdown and give out α (alpha), (Beta) (Gamma) rays
ii) *Non-radioactive isotopes*: These isotopes are stable:e.g.$_1H^1$, $_1H^2$ and $_{11}Na^{23}$.

Isobars:
Atoms of different elements having same atomic mass but different atomic no.s are called isobars like atoms of calcium and potassium.

General characteristics of isobars:

1. They are atoms of different elements.
2. They have different atomic number.
3. They have same mass number.
4. They possess different physical and chemical properties.
5. They have different number of protons, electrons and neutrons.

Reason For Fractional Atomic Masses and Calculation of Average Atomic Masses:

Atomic masses of a large number of elements are fractional and not whole number e.g. atomic mass of chlorine is 35.5 while that of copper is 63.5. The reason for the fractional atomic masses is that for an element existing in different isotopes i.e. atoms with different mass numbers, the atomic mass of the elements is the average value which comes out to be fractional. The calculation of average value of the atomic mass may be illustrated with the help of following example: chlorineis found to exist in 2 isotopes with mass numbers 35 and 37 respectively. These are found in the ratio of 3:1 i.e. 75% chlorine-35 and 25% chlorine-37 isotope. Hence,

Average atomic mass = (¾) x 35 +37x(1/4) = 35.5 amu

Q) If K and L shells of an atom are full, then what .....

A) If K and l shells of an atom are full, it means | K L M N |

2.8

And number of electrons is 10.

Q) Compare the properties of electrons, protons .....

Property	Electron	Proton	Neutron
Symbol	e or $_{-1}e^{0}$	P or $_{1}H^{1}$	N or $_{0}n^{1}$
Relative charge	-1	+1	0
Rel. mass inamu	1/1837	1	1
Electric behavior	Attracts towards +ve plate	Attracts towards -ve plate	Unaffected
Position within atom	Outside the nucleus	Inside the nucleus	Inside nucleus

Q)What are the limitations of Thomson's Model of Atom?

The limitations of Thomson's model of atom are:

1. He considered atom to be a sphere such that electrons are embedded in it.

2. He was unaware of the fact that electron revolves around the nucleus in a orbit.
3. He was unaware of the presence of neutrons in the nucleus of atom.
4. He was unaware about the position of nucleus in the atom.

Q) Na^+ means that sodium has last one electron……

a) In neutral state, sodium shows an
electronic configuration of Na(Z =11) K L M N
2 8 1

Butfor Na^+ , it is like: K L M N
2 8 0

It indicates that sodium is quite stable as Na^+ because K and L shells are completely filled and the one electron which was (present in M shell) that was making it unstable is lost by Na to achieve stable configuration.

Q) If Br-atom is available in the form of two…..

A) For $_{35}B^{79}$ %age 49.7% 50% and
For $_{35}Br^{81}$ %age 50.3 % 50%
Average atomic mass =
79x50/100 + 81 x 50/100= 79/2 + 81/2= 160/2= 80u.

WORK

In ordinary language, the word work means any physical or mental activity. For example:

1. You may read a book or exert yourself mentally thinking about simple or difficult problems.
2. You may be holding a weight without moving.

SCIENTIFIC CONCEPT OF WORK

In Physics work is said to be done, when force produces motion. Or Work is said to be done when the force applied on the body produces the displacement in it. Work is a scalar quantity.

For example,

1. When an engine moves a train along a railway line, it is said to be doing work.
2. A horse pulling the cart is also doing work and
3. A man climbing the stairs of a house is also doing work in moving himself against the force of gravity.

The work done by a force on a body depends on two factors.

(i) Magnitude of the force and

(ii) Distance through which the body moves (in the direction of force).

MATHEMATICAL EXPRESSION FOR WORK.

Work done in moving a body is equal to the product of force exerted on the body and the distance moved by the body in the direction of force.

If a force F acts on a body and moves it a distance "s" in its own direction then:

Work done = Force x distance

$W = F \times s$

<u>UNITS of work</u>

Work is the product of force and distance. Now, unit of force is Newton (N) and that of Distance is meter (m). So the unit of the work is Newton meter which is written as Nm.

The Newton meter is also called Joule (S.I unit) which is denoted by the letter J. (In the honor of Doctor James Prescott Joule) and can be defined as follows:

Joule: When a force of 1 Newton moves a body through a distance of 1

meter, then the work done is known is 1 joule. That is,
1 Joule = 1 Newton x 1 meter
Or 1J = 1 Nm
Bigger Units,
1 Kilojoules (1 KJ) = 1000J or 10^3J
1 Mega Joule (1MJ) = 1000000J or 10^6 J

WORK DONE AGAINST GRAVITY

The force of gravity of earth pulls everything toward the surface of earth. So if we lift a book from a table we do work against the force of gravity. Please note that when a body is lifted vertically, work has to be done on the body.

Suppose a body of mass m is lifted vertically upward through a distance h. In this case, the force required to lift the body will be equal to weight of the body, m x g (where m is mass and g is acceleration due to gravity). Now

Work done in lifting a body = Weight of body X Vertical distance

Or $W = m \times g \times h$

Or $W = mgh$

Where W = work done m = mass of the body,
g = acceleration due to gravity,h = height through which the body of mass m is lifted.

WORK DONE BY A FORCE ACTING OBLIQUELY

In many cases, the movement of the body is at an angle to the direction of the applied force. For example, when a child pulls a car with a string attached to it, the car moves horizontally on the ground, but the force applied is along the string held making some angle with the ground.

The toy car moves along the horizontal ground surface OX but the force is being applied along the string OA. The direction of force making an angle$\theta$with the direction of motion.

WORKDONE WHEN A BODY MOVES AT AN ANGLE TO THE DIRECTION OF FORCE

The work done in pulling the body will be equal to the product of horizontal component of the distance moved by body. In this case the horizontal component of the force and distance moved is s. Thus, work done:

$W = F \cos \theta \times s$

Where, F = Force applied

θ Angle between the direction of force and direction of motion.

S = Distance moved

CASES:

1. When the force acting on the body in the direction of displacement.

The work done W by the force F is equal to the product of the force and the displacement s. i.e,

$W = F \times s$ $(\theta > 0 < 90)$ e.g. Cos 45 is positive

Here the work done is positive.

2. When the force acting on the body in a direction opposite to the displacement. The work done W by the force F is,

$W = -F \times s$ $(\theta = 180°)$ Cos 180 is negative

Here the work done is negative.

3. When the force is acting perpendicular to the displacement

The work done W by the force F is,

$W = F \cos 90 \times s$ $(\theta = 90°)$ $\cos 90° = 0$

$= F \times 0 \times s = 0$

Here the work done is zero.

1. Work done is positive when a force acts in the direction of motion.
2. Work done is negative when a force acts in the opposiedirection of motion of the body.
3. Work done is zero when a force acts at right angles to the direction of motion of the body.

ENERGY

Energy of an object is defined as its capacity for doing work and it is measured by the total quantity of work it can do. In physics also, anything which is able to do work is said to possess energy.

In short, energy is the ability to do work or energy is stored work.

Note: There is always a transfer of energy whenever the work is done.

HOW DOES AN OBJECT POSSESSING ENERGY PERFORM WORK

An object (A) that possesses energy can exert a force on another object (B) and transfer its energy to B. As a result of this, the object (B) may move and do some work Thus, the object (A) which made the object (B) move and perform some work, had a capacity to do work. Thus, any object that possesses energy is capable of doing works.

UNITS OF ENERGY

Since the energy possessed by a body is measured in terms of its capacity of doing work, the unit of energy is therefore, same as that of work i.e., joule (J). The unit of energy called 'joule' is named after a British physicist James Prescott Joule.

Joule: One joule (1 j) is the energy required to perform 1j of work. Bigger units of energy are.

Kilojoules, lKj= 1000 j. Mega joule, 1 Mj= 10^6 j

FORMS OF ENERGY

Nature has been very kind to us in providing us energy in various forms. These forms of energy are as follows.

1. *Solar* energy. The energy radiated by the sun is called the solar energy. Plants collect and store this energy to make food through photosynthesis.
2. *Heat* energy. It is the energy released when coal, oil, gas or wood burn and it produces in us the sensation of warmth.
3. *Light* energy. It is the form of energy which produces in us the sensation of sight. Sun is the natural source of light.
4. *Chemical* energy. It is the energy possessed by fossil fuels (coal, petroleum and natural gas) and is also called the fuel energy. The food that we eat has chemical energy stored in it.
5. *Hydro* energy. The energy possessed by water flowing in rivers and streams is called hydro energy. This energy is used for generation electricity in hydroelectric power plants.
6. *Wind* energy. The energy possessed by moving air is called wind energy.
7. *Oceanthermal* energy (OTE). Solar energy stored in the ocean in the form of heat is called ocean thermal energy.
8. *Geothermal* energy. It is the heat energy of the earth and is found within rock formation and the fluids held within those formations.
9. *Biomass* energy. It is the energy obtained from biomass (i.e., living matter or its residues).
10. *Tidal* energy. It is the energy derived from the rising and failing ocean tides.
11. *Sound* energy. It is the energypossessed by vibrating objects andit produces in us the sensation of hearing.
12. *Mechanical* energy. It is the possessed by a body due to its position (Or

configuration) or motion. The energy possessed due to position or configuration is called potential energy and that due to motion is called kinetic energy. The sum of these two energies is called the mechanical energy.

13. *Electric* energy. The energy is the energy that is stored in charged particles within an electric field.

14. *Magnetic* energy. It is the energy possessed by magnetized bodies e.g., a magnet.

KINETIC ENERGY

The word kinetic energy is derived from the greek word "Kinetikos" meaning " to move. Hence, Kinetic energy means energy due to motion.

Kinetic energy of an object is defined as the energy which it possesses by virtue of its motion, and is measured by the amount of work that the object can do against an opposing force before it come to rest. Kinetic energy is denoted by E_K.

Example of bodies possessing kinetic energy:

1. A ball rolling on a surface because it can set another ball into motion by striking it.
2. A bullet fired from a gun as it is able to penetrate some distance into a target which it strikes
3. Water in motion as it can turn a wheels or a turbine.

EXPRESSION FOR KINETIC ENERGY

Consider a body of mass 'm' which is initially at rest(u = 0). When a force 'F is applied on the body, let it start moving with a velocity V and cover a distance 's' , the force produces acceleration 'a' in the body.

The force 'F' does work when it move the body through a distance S and this work done is stored in the body as its kinetic energy.

By definition,

W = Fxs (Fxs = Kinetic energy) ..... (1)

From second law of motion,

$$F = m a$$

Or $a = F/m$ ___(2)

From third equation of motion.

Also $v^2 - u^2 = 2as$

u = 0

$v^2 = 2as$ --------(3)

Using equation (2) in (3)we get,

$v^2 = \frac{2FS}{m}$

$mv^2 = 2Fxs$ .....(4)

$Fxs = \frac{1}{2} mv^2$

From equation (1) and (4) we get

$W = \frac{1}{2} mv^2$

Since work done is stored in the body as its Kinetic energy equation (4) can be written as

Orkinetic energy $= \frac{1}{2} mv^2$

Kinetic energy of a moving body is defined as the half the product of the mass oftheobject and square of the speed of the body.

SOME IMPORTANT CONCLUSIONS

We have just seen that the kinetic energy of a body of mass m and moving with a velocity (or speed) v is given by the formula:

Kinetic energy $= \frac{1}{2} mv^2$

From this formula, it is clear that K.E. is directly proportional to v^2

POTENTIAL ENERGY

The energy possessed by an object by virtue of position or configuration is called its potential energy. Potential energy is denoted by Ep or U. It is measured by the work that the object can do in passing from its present position or configuration to some standard position or configuration (known as zero position or zero configuration)

Potential energy is also termed as configuration energy or mutual energy.

EXAMPLES OF BODIES POSSESSING POTENTIAL ENERGY.

(a) Potential energy due to position.

i.A lifted weight as it can do work when it falls down under gravity.

ii Water stored in reservoirs. In GobindSagar Lake (Bhakra Dam) huge quantity of water is stored . It is the potential energy of this water, which generates electricity for us.

b) Potential energy due to configuration.

i. A coiled spring in cases of a watch, a toy or a gramophone. When coiled spring uncoils. It does work by rotating the hands of the watch sitting the toy in motion or rotating the gramophone.

ii. Compressed gas in a cylinder. When the compressed gas changes its configuration (i.e., expand) it does work.

iii. A stretched bow. When the bow is released, it is able to shoot the arrow with a large velocity.

TYPES OF POTENTIAL ENERGY

PotentialEnergy is of many types:

1. Gravitational potential energy (of a lifted weight).
2. Elastic potential energy (of a coiled spring)
3. Electrostatic potential energy. (Due to charged particles)

EXPRESSION FOR POTENTIAL ENERGY

Suppose a body of mass m is raised to a height h above the surface of the earth. The force acting on the body is the gravitational pull of the earth(m x g) which acts in the downward direction. To lift the body above the surface of the earth, we have to do work against this force of gravity. Now,

Work done = Force x Distance

So, W = m x g x h (F= mg)

This work gets stored up in the body as potential energy, thus

Potential energy, E_p =mgh

Where, m is mass of the body, g is acceleration due to gravity

his height of the body above a reference point, say the surface of earth.

Potential energy is usually denoted by the letters P.E. Another symbolof potential energy is E_p (where E stands for Energy and P for potential).

ENERGY TRANSFORMATIONS

The changing of one form of energy into the other is known as transformation of energy. We have discussed various form of energy available to us. Can we convert energy from one form to another? The answer is in the affirmative as is clear from the following example.

1. *Conversion of mechanical into electrical energy.* The potential energy of water stored in a dam is changed to kinetic energy when it falls from a height. This kinetic energy rotates turbines to produce electrical energy.
2. *Conversion of electrical energy into mechanical energy*. An electric

motor uses electrical energy to run various electrical appliances, e.g. a train, fan, washings machine, grinder etc.

3. *Conversion of electrical energy into heat energy.* In an electric heater, a geyser, an oven etc. electric energy is changed to heat energy.
4. *Conversion of heat energy into mechanical energy.* In heat engines (e.g., a steam engines) heat energy changes to mechanical energy.
5. *Conversion of electrical energy into light energy*. In an electric bulb, fluorescent tube, a flood light etc electrical energy is changed to light energy.
6. *Conversion of electric energy into sound energy.* An electric bell, a stereo, a loudspeaker etc. change electric energy into sound energy.
7. *Conversion of chemical energy into heat energy*. When fuels are burnt, chemical energy is converted into heat energy.
8. *Conversion of electrical energy into chemical energy.* When a battery is charged, an electrical energy changes into chemical energy. An inverter in our home does the same things.
9. *Conversion of sound energy to electrical energy.* A microphone converts sound energy into electrical energy.
10. *Conversion of chemical energy to electrical energy.* An electric cell converts chemical energy into electrical energy.
11. *Conversion of light energy into electric energy.* A solar cell converts light energy into electrical energy.
12. *Conversion of chemical energy into mechanical energy.* In automobiles, chemical energy of petrol ,diesel or CNG (Compressed Natural Gas) is converted into mechanical energy.
13. *Conversion of light energy into chemical energy.* In photosynthesis energy form the sun is absorbed by green plants and is converted to chemical energy.
14. *Conversion of nuclear energy into electrical energy.* Nuclear power plants are used to generate electrical energy form nuclear energy

LAW OF CONSERVATION OF ENERGY

"Energy can only be converted from one form to the other, it can neither be created nor destroyed, and as such the total energy in this Universe remains constant".

This law is true for all situations and for all kinds for transformation. This

law was first stated by Robert Mayor, german physicist in 1842 and was firmly established by Helmholtz.

COMMERCIAL UNIT OF ENERGY

KILOWAT HOUR (KWH)

To express large quantities of energy, a joule is found to be very small and as such an inconvenient unit. For this purpose, a bigger unit of energy, called a Kilowatt hour (kWh) is used.

One Kilowatt hour is the amount of energy consumed (or work done) by an agent in one hour working at a constant rate of one kilowatt. Clearly

lkWh= 1 kW xlh = 1000 W x h

= 1000 (j/s) x 3600s

= 3600000joule ~~sec~~/~~sec~~

= $3.6xl0^6$j

= 3.6 Mj

POWER

The rate of doing work is known as power, so we can say that the power of young man is more than that of the old man.

Power is defined as the rate of doing work.

We can obtain power by dividing the 'Work done' by time taken for doing the work. That is,

$$\text{Power} = \frac{\text{Work done}}{\text{Time taken}}$$

Or $P = W/t$

In other words, power is the work done per unit time or power is the work done per second.

Where, P = Power W = work done t = Time taken

Power is a scalar quantity which has only magnitude but no direction.

Thus, power is also defined as the rate at which energy is consumed (or utilized). We can also obtain power by dividing 'Energy consumed' by' Time taken' for consuming the energy. That is.

$$\text{Power} = \frac{\text{Energy consumed}}{\text{Time taken}}$$

$P = E/t$

Where P = Power, E = Energy, t = Time taken

UNITS OF POWER

Work is measured in the unit of 'joule' and the time is measured in the unit of 'second', so the unit of 'power is 'joules per second'.This unit of power is called 'watt' which is denoted by the symbol W.

1 watt is the power of an appliance which does work at the rate of 1 joule per second.

1 watt is the power of an appliance which consumes energy at the rate of 1 joule per second. We can write an expression for watt as follows.

$$1\ \text{watt} = \frac{1\ \text{joule}}{1\ \text{second}}$$

$$\text{Or } 1W = \frac{1j}{1s}$$

So 1 watt = 1 joule per second

Watt is an important unit of power since it is used in electrical work. The power of an electrical appliance tells us the rate at which electrical energy is consumed by it.

The unit of power called “watt” is named after a Scottish inventor, engineer and designer James Watt who became famous for improving the design of steam engine.

Watt is a small unit of power. Sometimes bigger units of power called kilowatt (kW) and megawatt (MW) are also used.

1 kilowatt = 1000 watts Or 1 Kw = 1000 W

1 megawatt = 1000,000 watt Or 1 MV = 1000,000 W

Or 1 MW = 10^6 W

A yet another unit of power is called 'horse power' (HP) which is equal to 746 watts.

Relation between kilowatt-hour and joule

1 kilowatt- hour is the amount of energy consumed at the rate of 1 kilowatt for 1 hour. That is,

1 kilowatt-hour= 1kilowatt for 1 hour

Or 1 kilowatt- hour= 1000 watts for 1 hour ....(1)

But lwatt= 1 joule/1 second

So, equation (1) can be rewritten as:

1 kilowatt-hour= 1000 joules for 1hour

And, 1 hour= 60x60 seconds

So, 1 kilowatt- hour= 1000 joules x 60x60 seconds

Second

Or, 1kilowatt- hour= 36,00,000 joules. (Or 3.6x 10^6 joules).

TEXTUAL QUESTIONS

*Ql. A force of 7 N acts on an object. The displacement is,....*Ans. Force acting on the object, F = 7 N

Displacement of the object, S = 8 m

Work done = FxS =7x8 = 56 j.

Q2. When do we say that work is done?

A. Work is done when force acting on a body produces a displacement in it.

Q4. Define 1 J of work.

A. The amount of work done when a force of 1 N moves of body through a distance of 1 m in the Direction of force is equal to 1 joule.

Q5. A pair of bullocks exerts a force of 140 N on a…..... SOL. Work Done = Force x distance

= 140 N x 15 m

= 2100 joule.

Q6.What is the kinetic energy of an object?

A. Refer to above notes.

*Q7. Write an expression for the Kinetic energy of an object.*A. K.E. = ½ mv_2

If an agent does W unit of work in time t then the power P is given byP = W/t

Q9. Define 1 watt of power.

Ans. 1 watt is the power of an agent which does a work at the rate of 1 joule per second or we can say that power is 1 watt when the rate of consumption of energy is 1 joule per seconds.

1 W = 1 j/s

Ql . Define average power.

A. When an agent does work at different rate at different interval of time. Then its power varies with the time. In this case the power of an agent is replaced by average power. It can be obtained by dividing the total energy consumed by the total time taken.

Average power = total energy consumed/ total time taken Average power, P = W/t

Q12. An object thrown at a certain angle to the ground ……. A. The force of gravity is acting in downward direction. The body move in first half time upward to reach maximum height and in second half time it comes downward and the displacement in the vertical direction (in the direction of the force) is zero, so work done is zero. So no net work is done by the force of gravity.

Q13. A battery lights a bulb. Describe the energy ……A. (i) Chemical energy changes into electrical energy.

(ii) Electrical energy changes into heat energy.

(iii) Heat energy changes into light energy.

Q14. A mass of 10 kg is at a point A on a table. It is ……..

A. The force of gravity is acting downward but the body is moved horizontally. There is no displacement in downward direction. The angle between the force of gravity and direction of motion of object is 90°

Therefore, work done by gravity, = F x cos 90^0 = F X 0 = 0

Hence work done on the object by gravity is zero.

Q15. The potential energy of a freely, falling object …… A.The decrease in potential energy of a falling body does not violate the law of conservation energy because as the body falls downward its potential energy goes on changing into kinetic energy of the body. The total energy i.e. the sum of potential energy and kinetic energy at all point will always be same.

Q16. What are the various energy transformations that …… A. Muscular energy in humans used for doing mechanical workkinetic energy.

Q17. Does the transfer of energy take place when we push…..

A. The transfer energy takes place when we push a huge rock and fail to move it. The energy is going to overcome the frictional force between ground and rock.

Q18. A certain household has consumed 250 units of …..

a. 1 kWh =3.6xl0^6j

250 kWh =250x3.6xl0^6

1

= 9 x 10^8 j

*Q19. What is the work done by the force of gravity…….*A. The satellites moves round the earth in a circular path. Therefore work done by the force of gravity on the satellite is zero because the angle between the reaction of the motion and the gravitational force on the satellite is 90°

$W = FS\cos\theta$

$= FS\cos 90°$

Since $\cos 90° = 0$

$W = FS \times 0 = 0.$

Topic: Force and laws of motion

Force: Force may be defined as an influence, which tends to change state, speed, direction and shape of a body. It has both magnitude and direction and is therefore, a vector quantity. It may also be defined as an external agency, which changes the speed and direction of a body. It can also change the shape of a body. Force is a vector quantity. It is represented by an arrow.

Units of force: In S.I system, force is measured in Newtons represented by letter "N" while as in C.G.S system its values are represented in Dynes

Newton: The force applied is said to be one Newtonif it produces acceleration of l/m/sec^2 and in a body of mass 1 Kg.

Dyne: The force applied is said to be one dyne if it produces acceleration of 1cm/sec^2 in a body of mass 1 gram.

Effects of force:

Some of the common effects of force are:-

1. A. force may move a body at rest. For example, when we kick a football kept on the ground with our foot, the football moves. The force applied by our foot moves the ball.

2. A force may stop a moving body. For example, when a player catches a moving cricket ball, the force applied by player's hands stops the moving ball.

3. A force can change the speed of a body. For example, when a ball is dropped from a certain height, the speed of the ball goes on increasing due to gravitational pull of the Earth on the ball, in the downward direction. Thus force applied by the Earth in the direction of motion of the ball increases the speed of the ball. :

4. A force may change the direction of a moving body. For example, when a moving cricket ball is hit by a bat, the cricket ball moves in a different direction. The force applied by the bat changes the direction ofthe moving cricket ball.

5. A force may change the size and shape of a body. For example, when we

press a rubber ball or a balloon between our two hands, the shape of the rubber ball or balloon changes. The forces applied by our hands change the shape of the rubber ball/balloon.

Forces can be classified into two classes:-

1. Contact forces
2. Action at a distance forces.

1. The contact forces represent the result of physical contact between two objects, one by which force is exerted and the other on which force isexerted e.g. pulling of a coiled spring, pulling of a cart.

2. The action at a distance forces are the forces which do not involve physical contact between the two objects but actthrough the space between the two e.g. the gravitational force, electrical force etc.

Types of force: Forces are of main two types, viz.

(i)*Balancedforce*: A force is said to be balanced if the resultant of all the forces acting on a body is equal to 0. A body under the influence of a balanced force does not change its position of rest or uniform motion and appears as if no force is acting on it. For example:In the game of tug of war, the two teams pull each other in the opposite directions. If the two teams pull the rope with equal force i.e. $F_1 = F_2$, then the rope does not move in either direction. Under this condition, the forces acting on a rope are balanced forces.

(ii) Unbalanced force: A force is said to be unbalanced if the resultant of all the forces acting on a body is not equal to 0. A body under the influence of unbalanced force changes its position of rest and uniform motion. For example in the tug of war, if the force applied by a team is greater than that applied by the other team. Then the members of the weaker team will be pulled towards the stronger team. Thus, the unbalanced forces produce motion.

Newton's Laws of Motion: (1692 - 1772) Newton devised three basic laws based on his name, to describe motion. These laws are known as Newton's laws of motion and are explained as under:

Newton's First Law of Motion or Galileo's Law of Inertia:

It states that, "Everybody continues to remains in the state of rest or uniform motion until and unless compelled by some external forceto change its state of rest or motion". In other words, the first law of motion recognizes that everybody has some inertia i.e. the property of a body to remain in a state of rest or uniform motion. This law is accordingly also known as, "Law of inertia". For example:

(i) A book lying on a table will remain there unless and untilsomebody will come and change its place.

(ii) A cricket ball will remain in motion after hit by the player unless and until the force of friction and the resistance of air stop it and changes its motion into rest.

Inertia: The word inertia means unchanging. It has been derived from the Latin word inert. It is defined as the property of a body to remain in the state of rest or uniform motion. In other words, inertia may be defined as the property of a body to remain in the state of rest or uniform motion. A heavier body has more inertia than a lighter body. Therefore, we can say that "The larger the mass, the larger is the inertia, and smaller the mass, smaller is the inertia."

In other words we can say that "The mass of a body is a measure of its inertia."

It is of three main types:-

(i) *Inertia of Rest:* It is the inability of a body to change its state of rest or its property to remain in rest. This means a body at rest remains at rest and cannot start moving on its own.

ii) Inertia of Motion: It is the inability of a body to change its state of motion or it is the property of a body to remain in the same

direction, for example Balls bowled by a bowler remain in same direction until it is played off by the batsman, for example, a cricket ball will remain in motion after hit by the player unless and until the force of friction and the resistance of air stop it and changes its motion into rest.

iii) Inertia of direction: It is the inability of a body to change by itself its direction of motion, i.e., a body moving along a straight line will continue to move along the same direction unless some external force compels it to change the direction of motion ,for example Balls bowled by a bowler will remain in same direction until it is played off by the batsman.

Examples of inertia

1. *Why are passengers thrown in the forward direction when a running bus stops suddenly?*
    a. Passengers sitting or standing in a running bus share the motion of the bus. This means, the passengers in a running bus are also moving with the same speed in the same direction. When the running bus stops suddenly, the lower part of the passenger's body comes to rest, while the upper body portion continues to remain in motion. As a result, the passengers are thrown in the forward direction when a running bus stops suddenly.

2. *Why do Passengers tend to fall side ways the bus takes a sharp turn?*
    a. When a bus runs along a straight line path, all the passengers traveling in the bus also move with the same speed in the same direction. When the bus! takes a sharp turn, the upper body portion of the passengers still continues to move in the original (straight

line) path, while the lower portion tends to turn with the bus. As a result, passengers tend to fall/ lean side ways.

3. *Why should a passenger hold on to a support to prevent himself from swaying in a turning bus?*
    a. A person travelling in a bus shares the motion of the bus. When the bus takes a turn, it changes its direction of motion. The passenger due to his inertia of motion, however, continues to move in the original direction. So, if the passenger does not hold on to a support, he will be swayed away.
4. *Why do passengers in a bus tend to fall backward when it starts suddenly?*
    a. When a passenger in sitting or standing in a stationary bus, both the bus and the passenger are at rest. When the bus starts moving suddenly, the lower part of the passenger's body starts moving forward with the bus. The upper part of the body tends to remain in the position of rest due to its-inertia of rest. As a result, therefore, the passenger falls or leans backwards. Similarly a rider on horseback falls backwards when the horse suddenly starts running.
5. *Why does a passenger jumping; out of a rapidly moving bus fall forward with his face downwards, if he does not run forward?*
    a. A passenger traveling in a bus shares the motion of the bus. Thus, the passenger's body is moving in the direction of the bus with the same speed. When a passenger jumps out of a fast moving bus, his feet on touching the ground come to rest, whereas the upper part of his body continues to move forward due to inertia of motion. As a result, if he does not run forward he falls with his face downwards.
6. *Why can dust be removed from a carpet by shaking it, or by beating it with a stick?*
    a. Initially, both the carpet and the dust therein are at rest. When the

carpet is shaken or beaten with a stick, the carpet is set into motion. Due to inertia of rest, the dust particles tend to remain at rest. Asa result, the dust particles fall off.

Newton's Second Law of Motion:

According to Newton's second law of motion, the rate of change of linear momentum of a body is directly proportional to the external force applied on the body, and this change takes place always in the direction of the applied force.

Now, the rate of change of linear momentum of a body can be obtained by dividing "change in linear momentum' 'of the body by the 'time taken' for this change. Thus, according to Newton's second law of motion.

$$\frac{\text{Change in linear momentum}}{\text{Time taken}} \propto \text{force applied}$$

Mathematical formulation of Newton's second law of motion:

Suppose m = mass of body,

u = initial velocity of the body along a straight line

F = an external force applied on the body which is constant in magnitude

t = time for which the force is applied

v = Final velocity of the body along the same straightline, after t second.

Initial linear momentum of the body $P_1 = mu$

Final linear momentum of the body $P_2 = mv$ Change in linear momentum of the body $= P_2 - P_1$

$= mv - mu$

$= m(v - u)$

$$\text{Rate of change of linear momentum} = \frac{\text{change in linear momentum}}{\text{time taken}}$$

$$= \frac{m(v - u)}{t} \quad \ldots\ldots..(i)$$

.

But $\frac{(v - u)}{t}$ = rate of change of velocity = acceleration of the body = a

Therefore from equation (i), rate of change of linear momentum = ma

Accordingto Newton's second law of motion, rate of change of linear momentum a force applied

Therefore $ma \propto F$

Or $F \propto ma$

Or $F = kma$.....(ii)

Where k is a constant of proportionality. The value of k depends on the units adopted for measuring the force.

If we define F = 1, when m = 1 and a = 1 i.e., unit force is that much force which produces unit acceleration in a body of unit mass, then from equation (ii)

I = k x 1 x 1 or k = 1

Putting this value ofk in equation (ii), we get

F = ma

This is the mathematical form of Newton's second law of motion. It state that Force acting on a body is the product of mass of the body and acceleration of the body.

Relation between force and acceleration:

From the Newton's second law, of motion, we have:

F = m x a

Or a = F/m

From the above equation, it is clear that acceleration produced in a body is directly proportional to the force acting on it and inversely proportional to its mass.

Newton's Third Law of motion:-.

It states that, "If a body exerts a force on some other body, then the second body exerts a force of same magnitude on it but in opposite direction". Thus, in other words ,it states that "To every action there is an equal and opposite reaction". For example:

1. When a ball is thrown on to a wall, it comes back with the same force and speed..
2. When we pull a spring, it pulls us back with the same force.
3. When we hit a ball to the ground, it comes back at the same speed.

Examples:-

1. When you strike a rubberball against a hard floor, the ball exerts a force (called action) on the floor. The floor exerts an equal and opposite force (called reaction) on the ball. The rubber ball, being light, rebounds.
2. When a gun is fired, the bullet goes out due to the force applied on it through the trigger (this is action). The gun recoils backward due to the reaction acting on it in the opposite direction. This gives a backward jerk to the shoulder of the gunman.

The change in the momentum of the bullet is equal-and opposite to that of the gun. Initially, both the shot and the gun are at rest. So, the momentum produced in the gun is equal and opposite to that produced in the bullet. Thus,

Mass of bullet x speed of the bullet = Mass of the gun x speed of the gun.

Since, the mass of the gun is much greater than that of the bullet, hence the speed of the gun is very small as compared to that of the bullet. Therefore, the gun moves backwards only by small distances during recoil.

Newton's first law of motion is a special case of Newton's second law:-

Newton's first law of motion can be deduced form Newton's second law of motion. According to Newton's second law of motion,

$$F. = ma$$

$$= \frac{m (v - u)}{t} \quad .$$

Or F x t = mv - mu

When no externalforce is applied, F = 0

Therefore,

mv-mu = 0

Or mv = mu

or v = u

It means the body will continue to move with the same uniform velocity, u throughout the time , when no external force is applied on the body. Further, if u = 0, then v will also be zero. It means if the object is initially at rest, it will continue to be at rest, when no external force is applied on the body.

This is Newton's first law of motion.

Momentum: It may be defined as the product of mass and velocity of a body and is infact meant for the measure of the motion of a body. Thus,

Momentum = Mass x Velocity

Or P = m x v

Momentum of a body has both magnitude and direction and is therefore a vector quantity. On S.I system, it is measured in Kgm/sec^2 written as kgm/sec^2.

Relation between force and momentum:

Consider a body of mass (*m*) having an acceleration of

(*a*) m/sec^2 .Then, the force exerted by the body (*F*) can be given by the relation.

F = m.a .....(i)

Let the force applied (*F*) changes the velocity of a body from 'u' m/sec^2 to v m/sec^2 in a time (*t*) sec. Then, the acceleration produced can be given as:

$$a = \frac{v-u}{t}$$

Now, substituting the values of "a" in equation (i), we get

F= m x a

$$F = \frac{(v - u)}{t}$$

$$F = \frac{mu - mv}{t}$$

where mu = Initial momentum of the body

and mv = Final momentum of the body

$$\text{Thus} \quad \text{Force} = \frac{\text{Final momentum - Initial momentum}}{\text{time}}$$

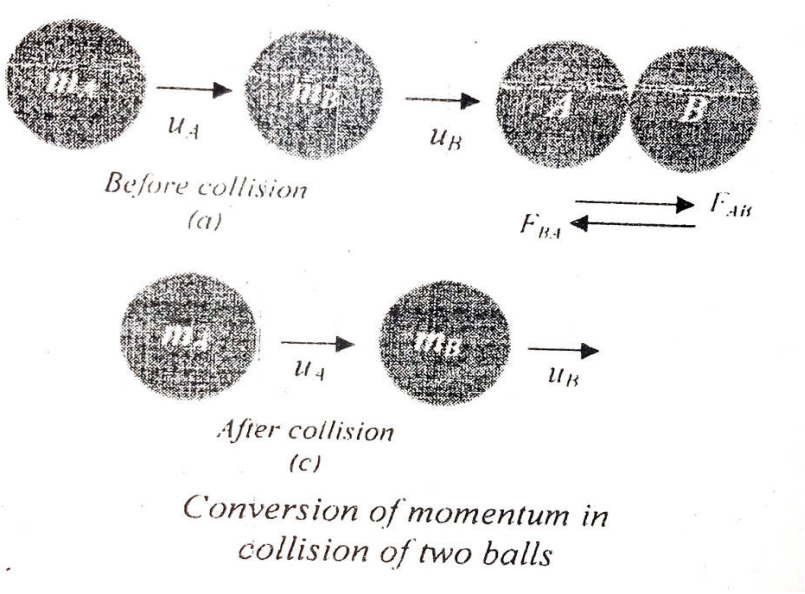
$$\text{Or} \quad \text{Force} = \frac{\text{Change in momentum}}{\text{Time taken}}$$

Or Force = rate of change in momentum

Thus, from the above relation, it is clear that the force applied to a body is directly proportional to the rate of change in momentum produced in the body, when the change in momentum takes place in the direction of force applied. Thus the relation of force and momentum gives another statement of the Newton's second law of motion.

Law of conservation of momentum: According to this law:

When two or more bodies interact with one another, the vector sum of their linear momenta remains constant (i.e. conserved), and is not affected due to their mutual action and reaction. The only condition is that no external unbalanced forces should be acting on the system of bodies. We can prove this law by considering an ideal collision experiment between two bodies. .



Conversion of momentum in collision of two balls

Suppose two objects (two balls A and B, say) of masses m_A and m_B are travelling in the same direction along a straight line at different velocities u_A and u_B, respectively. And there are not otherexternal unbalanced forces acting on them. Let $u_A > u_B$ and the two balls collide with each other. During collision which lasts for a time 't' the ball A exerts a force F_{AB} on ball B and the ball B exerts force F_{AB}on ball A. Suppose

v_A and v_B are the velocities of the two balls A and B after collision respectively. We know the momenta of ball A before and after the collision are m_Au_A and m_Av_A, respectively. The rate of change of its momentum (or F_{AB} action) during the collision will be

$$m_A x \frac{(v_A - u_A)}{t}$$

Similarly, the rate of change of momentum of ball B (=F_{BA} or reaction) during the collision will be

$$m_b x \frac{(v_B - u_B)}{t}$$

According to the third law of motion, the force F_{AB} exerted by ball A on ball B (action) and the force F_{BA} exerted by the ball B on ball A(reaction) must be equal and opposite to each other. Therefore,

$F_{BA}=-F_{AB}$

$$m_A \frac{v_A - u_A}{t} = m_B \frac{v_B - u_B}{t}$$

This gives $$\frac{m_Av_A - m_Au_A}{t} = \frac{m_Bv_B - m_Bu_B}{t}$$

Or $m_Av_A + m_Bu_B = m_Av_A - m_Bv_B$

Since $(m_Au_A + m_Bu_B)$ is the total momentum of the two balls A and B before the collision and $(m_Av_A + m_Bv_B)$ is their total momentum after the collision. From equation we observe that the total momentum of the two balls remains unchanged or conserved provided no other external force acts.

As a result of this ideal collision experiment, we say that the sum of momenta of the objects before collision is equal to the sum of momenta after the collision provided there is no external unbalanced force acting on them. This is known as the *law of conservation of momentum.*

Textual Questions

Q. If action is always equal to the reaction, explain how a horse can pull a cart?

A. The horse pushes the ground with its foot in backward direction by pressing the ground in a slanting direction. As a result of this action, the ground pushes the horse in the forward direction. Hence the horse pulls a cart.

Q. Why doesn't a truck move ifa student pushes it?

A. The truck does not move because the force of push applied is far less than the force of friction between the truck and the road. We also do not move because the force of reaction acting on us is less than force of friction between us and

the road.

Q. Why is it advised to tie any luggage kept on the roof of a bus with a rope?

A. Any luggage kept on the roof of a bus should be tied with a rope. This is because when the bus moves suddenly, the luggage pieces may fall down due to inertia of rest. Similarly, when the moving bus stops suddenly, the luggage pieces may fall down due to inertia of motion.

Q. Why a fireman struggles to hold a hose-pipe?

A. This is because the stream of water rushing through the hose-pipe in the forward direction with a large speed exerts a large force on the hose-pipe in the backward direction. The force exerted on the hose-pipe in the backward direction is known as the reaction force. This reaction force tends to move the hose-pipe in the backward direction Therefore, a fireman struggles to hold the hose-pipe strongly to keep it at rest.

Q. Explain why some of the leaves may get detached from a tree if we vigorously shake its branch?

A. When we shake vigorously a branch of a tree, some of the leaves may get detached on account of inertia of rest of the leaves. The branch comes in motion and the leaves try to be in the position of rest. Therefore, they get detached.

Q. Why does the fielder pull his arms back while trying to stop or catch a cricket ball?

A. When a fielder stops a fast moving cricket ball suddenly, the speed of the ball decreases from a high value to zero in a very short time. Therefore, the-retardation (negative acceleration) of the ball will be very large. As a result, the fielder has to apply a large force to stop the ball. The ball in turn exerts a large force on the fielder's hand. So, the fielder’s hand may get hurt when he tries to stop / catch a fast moving cricket ball suddenly without moving his hands.If the fielder stops the ball by gradually pulling his arms/hands back along with the ball, then the same change in speed is brought about in a larger period of time. Therefore, the retardation of the ball will be small. As a result the fielder has to

apply lesser-force to stop the ball. So, the ball will exert lesser force on the hands of the fielder and the fielder will not get hurt.

Chapter no: 2 Physical features of India

Q2:- Answer the following questions briefly:

i. What is bhabar?

Ans. The bhabar is that part of the northern plains of the northern plains where the rivers, after descending from the mountains, deposit pebbles.

ii. Name the three major divisions of the Himalayas from North to South .

Ans. The three major divisions of the Himalayas from North to South are:-

1. The Greater Himalayas.
2. The Middle Himalayas.
3. The Shiwaliks.

iii. Which Plateau lies between the Aravali and the Vindhyan Ranges?

Ans. Malwa plateau lies between the Aravali and the Vindhyan Ranges.

iv. Name the Island Group of India having coral origin.

Ans. The . Lakshadweep group of Islands have coral origin.

Q3:- Distinguish between:

i. Bhangar and Khadar

Bhangar	***Khadar***
i. The old alluvium of the northern plains is called Bhangar	The new alluvium of the northern plains is called Khadar.
ii. It is the part of the plain which is not affected by flood water every year.	Here flood water spreads almost every year and a layer of silt is deposited.

ii. Western Ghats and Eastern Ghats

Western Ghats	***Eastern Ghats***
i. Western Ghats lie on the western margin of the Deccan plateau.	Eastern Ghats lie on the eastern margin of the Deccan plateau.
ii. Western Ghats lie parallel to the Western coast along the Arabian Sea.	Eastern Ghats lie parallel to the eastern coast along the Bay of Bengal.

Q4:- Which are the major physiographic divisions of India? Contrast the relief of the Himalayan region with that of the peninsula plateau.

Ans. India has been divided into the following major physiographic divisions:

1. The Himalayan Mountain Chain

2. The northern plains
3. The peninsula plateau
4. The Coastal plains
5. The Islands
6. The Indian desert

The Himalayan Region	*The Peninsula Plateau*
i. Having a comparatively recent origin, it is made up of young fold mountains.	It is the oldest landmass of the Indian subcontinent, it was part of the Gondwana land.
ii. It is composed of sedimentary rocks	It is composed of Igneous and metamorphic rocks.
iii. It contains of the lofiest mountains and deep valleys.	It consists of broad and shallow valleys and rounded hills.
iv. From the point of view of geology this region forms an unstable zone	This region forms a stable zone.

Q5:- Give an account of the Northern Plains of India.

Ans. The Northern Plains have been formed by the deposition of sediments, brought down by various rivers. The length of the plains is about 2400km and the width varies between 240km – 320km. This is the most fertile and densely populated part of India. These plains are suitable for the cultivation of variety of crops like wheat, sugarcane, rice, tea, cotton, jute, vegetables etc. Because of its extensive cultivation, the northern plains are known as "Food Bowl" or the "Grainery of India"

Q6:- Write short note on the following:

1. The Indian Desert
2. The Central Highlands
3. The island groups of India

1. **The Indian Desert:-** Lying towards the west of the Aravali Hills, the Indian Desert is an undulating sandy plain covered with crescent-shaped and longitudinal sand dunes. This region is characterized by very little rainfall, an arid climate and low vegetation cover. Streams appear only during the rainy season. Luni is the only large river in this region.
2. **The Central Highlands:-** The part of the Peninsular Plateau lying to the north of the Narmada river, covering a major area of the Malwa plateau, is known as the Central Highlands. They are bound by the Vindhya Range from the south and by the further westward extension merges with the Indian Desert while the east-ward extention is marked

by the Chotanagpur Plateau. The rivers draining this region flow from south west to northeast. The Central Highlands are wider in the west but narrower in the east.

3. **The Island Groups of India**:- India has two groups of islands. The Lakshadweep Island lie in the Arabian Sea, to the southwest of the mainland. The Andaman and Nicobar Islands lie in the Bay of Bengal, to the south-east of the mainland.

   Lakshadweep is composed of small coral Islands, covering a small area of 32 square kilometers. Kavaratti Islands is its administrative headquarters. The Andaman and Nicobar islands are bigger in size and are more numerous and scattered. The entire group of Islands is divided into Andaman (in the north) and Nicobar (in the south).Both these Islands are rich in flora and fauna, and are of great strategic importance to the country.

Chapter 2 Socialism in Europe and Russian revolution

Q1: What were the social, economic and political conditions in Russia before 1905?

Ans: The social, economic and political conditions in Russia before 1905 were quite backward.

Social inequality was very prominent among the working class. Workers were divided on the basis of their occupation. Workers whose jobs needed skill and training considered themselves on a higher plane than the untrained worker. Workers had strong links to the villages they came from and this also caused a social divide among workers.

Economically Russia was going through a very difficult period. The population had doubled and the economic conditions turned from bad to worse. The government introduced new programmes of industrialization which created employment. This Industrialization did not help the workers who were exploited and their living condition only worsened.

Compared to other European nations, Russia was politically backward, during the thirteenth century. All political parties were illegal in Russia before 1914. The Russian peasants formed the Socialist Revolutionary Party in 1900, but as they were not a united group they were not considered to be part of a socialist movement.

Q2 In what ways was the working population in Russia different from other countries in Europe, before 1917?

Ans: The working population in European countries were a more united lot than the those in Russia .

Workers in England and Germany formed associations and fought for better living and working conditions. Funds were set up by these Associations to help workers in distress. The workers in European countries were united in their demand for reduction of working hours and the right to vote. Workers association also supported political parties and ultimately formed political parties themselves. The Labour Party in Britain and a Socialist Party in France are examples of political parties formed by socialists and trade unionists.

In total contrast to the working population in Europe, the Russian workers were not united. Workers were divided on the basis of their occupation. Workers whose jobs needed skill and training considered themselves on a higher plane than the untrained workers. Workers had strong links to the villages they came from and this also caused a social divide among workers. Workers' associations rose dramatically in Russia also, as in Europe. They demanded reduced working hours and higher wages. The workers were supressed .

Q3: Why did the Tsarist autocracy collapse in 1917?

Ans: During the winter of 1917, factory workers faced acute food shortage and extreme cold climate. Dissatisfaction was raging high among the workers.

A factory lockout on the right bank of the river Neva, triggered a strike in the month of February, 1917. 50 other factories joined in the strike. In many factories women led the strike. The government tried many measures to contain the strike. Curfew was imposed, the cavalry and police were called out to suppress the workers. The dissatisfied worker could not be contained. On the 27 of February, the Police Head Quarters' were ransacked.

The turning point of this revolt was when the government regiments joined the striking workers. They formed the ' Soviet' or 'Council'. The Tsar was advised to abdicate. Thus the February Revolution brought down the monarchy in 1917.

Q4: Make two lists: one with the main events and the effects of the February Revolution and the other with the main events and effects of the October

Revolution. Write a paragraph on who was involved in each, who were the leaders and what was the impact of each on Soviet history.

February Revolution:

→ 22nd February: Factory lockout on the right bank took place,

→ 25th February: Duma was dissolved.

→ 27th February: Police Headquarters ransacked. Regiments support the workers. Formation of Soviet.

→ 2nd March: The Tsar abdicated his power. The Soviet and Duma leaders formed a Provisional Government for Russia.

The February Revolution had no political party at its forefront. It was led by the people themselves. Petrograd had brought down the monarchy, and thus, gained a significant place in Soviet history. Trade Unions grew in number.

October Revolution :

→ 16th October: A Military Revolutionary Committee was appointed by Soviet.

→ 24th October: The uprising against provisional government begins. Military Revolutionary Committee controls the city by night and ministers surrender. The Bolshevik gained power.

The October Revolution was primarily led by Lenin and his subordinate, Trotskii and involved the masses who supported these leaders. It marked the beginning of Lenin's rule over the Soviet, with the Bolsheviks under his guidanceand gained power. The Russian Communist Party came into existence.

Q5: What were the main changes brought about by the Bolsheviks immediately after the October Revolution?

Ans: Many changes were brought about by the Bolsheviks after the October Revolution.

They were:-

(i) Banks and Industries were nationalised.

(ii) Land was declared social property.
(iii) Peasants seized land from the nobility.
(iv) Large houses were partitioned according to family requirements.
(v) Use of old titles by aristocrats was banned.
(vi) New uniforms were introduced for the army and officials. The famous soviet hat (budeonovka) was introduced.

Q6 :Write a few lines to show what you know about:

(i) Kulaks
(ii) The Duma
(iii) Women workers between 1900 and 1930.
(iv) The Liberals.
(v) Stalins collectivization programme.

(i) Kulaks:

Well-to-do peasants were called ‘ kulaks’ during Stalin’s leadership. As food shortage continued Stalin decided to introduce the Collectivisation Programme. Under this programme, ‘kulaks’ were eliminated. That is , land from these well-to-do peasants was forcibly taken and large state- controlled farms were established. This was done to modernize farming and increase production

ii) Duma :

The Duma is an elected consultative Parliament, which was set up during the 1905 Revolution. Though the Duma was accepted by the Tsar, they were constantly dismissed by the Tsar and new ones were set up. After the February Revolution when the Monarchy was over thrown , Duma leaders and Soviet leaders formed a Provisional Government in Russia.

III:Women workers between 1900 and 1930 :

Women workers made up 31% of the factory labour in the 1900s. They were paid only half or three quarters of the men's wages. During the February Revolution in 1917 , many women worker led the strikes. The condition of the women workers continued to be grim until the 1930s. Slowly conditions improved and crèches were set up in factories for the children of women workers.

(iv) The Liberals.

After the French Revolution people wanted a transformation in the society. Many groups were formed with this intention. One such group was the 'Liberals'. The Liberals wanted a nation with religious tolerance and individual rights. Though they wanted an elected parliamentary government, they wanted only men of property to have the right to vote. They were against women voting.

(v) Stalin's collectivization programme :

Stalin believed that collectivization of agriculture would help in improving grains supplies in Russia. He began collectivization in 1929. All peasants were forced to cultivate in collective farms (kolhoz). The bulk of land and implements were transferred to the ownership of the collective farm. Many peasants protested such attempts and destroyed livestock to show their anger. Collectivization did not bring the desired results in the food supply. Situation turned even worse in subsequent years.

Chapter 3

Topic: Climate

Q2 I)What are the factors affecting the climate of India?

Ans. The following factors influence the climate of India:

Latitude: Temperature generally decreases from equator towards the poles. The places close to the equator are hot than the areas far away from the equator.

Altitude: As one goes from the surface of the earth to higher altitudes, the temperature decreases.That is why Shimla is colder than Delhi. Similarly, Ooty in the Nilgiris is pleasant throughout the year though it is relatively close to the equator.

Relief features: The Mighty Himalayas acts as a climatic divide which protect the country from the Northern cold winds. Similarly the Western Ghats force the rain-bearing winds from the Arabian Sea to shed their moisture on the western slopes.

Distance from the sea: Places situated near the sea experience equable climate such as Mumbai etc. Places situated in the interior experience continental climate e.g Delhi, Amritsar , etc

.ii Why does India have monsoon type of climate?

Ans. The monsoons are seasonal winds which completely change their direction of flow with the change of seasons. Due to the difference in pressure the winds flow from sea to land during the summer season and from land to sea during the winter season. So the difference in pressure in different seasons leads to the monsoon type climate in India.

iii. Which part ……..? Why?

Ans. The north western part of India experiences the highest diurnal range of temperature because in the deserts day temperature may rise to 50 degree Celcius as the sand present there quickly becomes hot during day & cools down during night.

iv. Which winds account for rainfall along the Malabar Coast?

Ans: Malabar Coast receives bulk of rainfall by the South West Monsoon winds.

v. What are jet streams……..? why?

Ans. Jet streams are fast flowing, narrow,meandering air currents in atmosphere near the tropopause and are westerly winds. Their speed varies from about 110km/hr in summer to above 184km/hr in winter.Jet streams over the Indian Peninsula during the summer affect the monsoon. It effects the coastal regions of the country & is responsible for tropical cyclones during monsoon.

vi.Define monsoon. What do you understand by 'Break in monsoon'?

Ans .The word Monsoon is derived from the Arabic word 'Mausim' means season, which is characterised by reversal of wind direction. In general India has monsoon type of climate. The sudden approach of the moisture laden winds associated with violent thunder and the lightning is known as the breaking of the monsoons.

Vii.Why is the monsoon considered as a unifying bond?

Ans. There is a great diversity in climatic conditions of India, because of differences in relief features. But the whole climatic phenomenon of the country is governed by the all powerful monsoons. India gets about 80% of its rainfall due to these monsoons. These monsoons are active only for three or four months in a year and for the rest of the year India remains almost thirsty. This thirst is felt equally in all parts of the country. So their arrival is most welcome throughout the country. Agricultural activities of Kharief season start simultaneously in most parts of the country. Our festivals and cultural life revolves around monsoons. Hence monsoon act as a unifying bond in the country.

Q3.Why does rainfall decreases from east to west in the Northern India?

Ans. Away from the source of moisture i.e. sea, monsoon rainfall goes on decreasing. The Mighty Himalayas deflect the Bay of Bengal branch of monsoons westwards. These winds loose their moisture while moving from east to west in the northern India. That is why Kolkata receives 102cm, Patna 102cm, Allahabad 76cm, and Delhi 56cm of rain.

Q4. Give reasons as to why

a.Seasonal reversal of wind direction takes place over the Indian subcontinent?

Ans. It should be noted that winds always blow from high pressure towards low pressure. During summer season winds blow from the sea towards land because atmospheric pressure becomes low on land due to high temperature. On the other hand, during winter season winds blow from land towards sea because low pressure is built on the sea and high pressure is built on the land.

b.The bulk of rainfall in India is concentrated over a few months?

Ans.India receives about 80% of its rainfall from June – September, because it is the period of advancing monsoons.

c.The Tamil Nadu Coast receives winter rainfall?

Ans.During winter season the retreating monsoons pickup moisture while crossing the Bay of Bengal. These retreating monsoons are on-shore winds in Tamil Nadu Coastal plain. When they strike against the Eastern Ghats, they shed their moisture in this region.

d.The Delta of the Godawari, the Krishna and the Kaweri are frequently struck by cyclones?

Ans.In early November the low pressure Conditions which prevail over north western India get transferred to the Bay of Bengal. This shift is associated with occurrence of cyclonic depressions. These tropical cyclones are often very destructive and strike the thickly populated Deltas of the Godawari, the Krishna and the Kaveri. For example super cyclone of Orissa 1999 (October 29- 31) with wind velocity of more than 300 km/ hour killed about 1,00000 people, washed out 200 villages and claimed loss of property worth thousand billion rupees in the coastal areas.

e) Parts of Rajasthan, Gujrat and the leeward side of the Western Ghats are drought prone?

Ans .When a branch of Arabian Sea monsoon winds pass over parts of Rajasthan and Gujrat they become warmer and increase their capacity to hold moisture instead of shedding it. Besides the Aravali range do not act as a barier. Hence the south west monsoons cause no rainfall. That is why parts of Rajasthan, Gujrat and the leeward side of the Western Ghats are drought prone.

Q5.Describe the regional variations in the climatic conditions of India with the help of suitable examples.

Ans. There are perceptible regional variations in climatic conditions within the country. Equable type of climate is found in coastal areas, while extreme type of climate is found in the interior parts of North India. During summer temperature reaches upto 50°C in parts of Rajasthan desert, where as it may be around 20°C at Pahalgam in Jammu and Kashmir. On winter night temperature at Drass in J&K may be low as -45°C. On the other hand Thiruvananthapuran records the temperature of +20°C during the same season. Precipitation in the Himalayas is mostly in the form of snowfall, but in the rest of the country precipitation is in the form of rainfall. The annual rainfall varies from 400cm in Meghalaya to less than 10cm in Ladakh and western Rajasthan. Most parts of India receive rainfall in June to September. But some parts like Tamil Nadu Coast get most of its rains during autumn and early winter.

Q6: Discuss the mechanism of monsoons.

Ans. Phenomenon of monsoon refers to the seasonal reversal of winds. The offshore winds that blow from north east direction are reversed into onshore south western winds. This phenomenon is based upon differential heating of land and ocean bodies. During summer in the Indian sub continent the large land masses get heated up more repeatedly than the neighbouring seas, as a result the air above land expands & rises up. The moisture laden winds arrive on the western coast of indiafrom the south western side & cause heavy rainfall on the windward side of western ghats. Further rains occur in the northern plains & north east parts of india with the branching of monsoon.

Q7. Give an account ……. Season.

Ans. The cold weather season begins from November in northern India and stays till February. December and January are the coldest months in the northern parts of india.

Characteristics of cold season :

1. Weather is marked by clear sky, low temperature, low humidity &variable winds.

2. Days are warm & nights are cold. The higher slopes of Himalayas experience snowfall.

3. The inflow of cyclonic disturbances from west & the north west takes place.

Q8 Give the characteristics and effects of monsoon rainfall in India.

Ans. The monsoon season in India starts from mid June and continues up to mid September. The monsoon rainfall brings down the temperature considerably. India receives about 80% of its rainfall during the monsoon season but the spatial distribution of rainfall is highly uneven. Some regions like Meghalaya, Assam, the western Ghats, the western coastal plains receive heavy rains while some other regions like western Rajasthan, Rann of Kutchh, Leh ,etc receive scanty rainfall. As such the areas of high rainfall are liable to be affected by floods and the areas of low rainfall are drought prone.

Name two rainiest stations in India?

Mawshynram in Maghalaya and Agumbe inKarnatka and Amboli in Maharashtra are the rainiest stations in India.

Chapter 2 : Constitutional Design

Q1 : Here are some ---------- read in this chapter.

a) Leaders ---------- after independence.

Ans : Leaders of freedom movement were clear in their mind that the country should be democratic after independence.

b) Members ---------- constitution.

Ans : The members of the constitutional assembly of India held different views on all provisions of the constitution.

c) A country ---------- democracy.

Ans : A country that is democratic must have a constitution.

d) Constitution ---------- a country.

Ans : The constitution needs to be amended because it has to be in accordance with people's aspirations and changes in society.

Q2 : Which of these was the ---------- South Africa?

Ans : Between the white majority and the black minority.

Q3 : Which of these is a provision ---------- not have.

Ans : Name of the head of the state.

Q4 : Match the following ---------- constitution.

Motilal Nehru	Prepared a constitution for india in 1928
B.R. Ambedkar	Chairman of drafting committee
Rajendra Prasad	President of the C. Assembly
Sarojini Naidu	Member of the C. Assembly

Q5 : Read again the ---------- answer the following:

a) Why did Nehru use ---------- first sentence?

Ans : Because he thought that the task they had undertaken was incomplete and it wasn't possible to fulfill the pledge's cell at once but would be gradually fulfilled.

b) What pledge ---------- constitution to take?

Ans : The pledge that he wanted the makers of the Indian constitution to take was to dedicate their lives for the service of India, Indian's and humanity at large.

c) "The ambition of ----------" who was he referring to?

Ans : He was referring to Mahatma Gandhi.

Q6 : Here are some ---------- correctly.

a) iv
b) iii
c) ii
d) i

Q7 : How did your school ---------- brief report.

Ans : The occasion of 23 November is celebrated every year at our school with all its solemnity. It is marked by the conduct of special assembly by the students of the schools. The celebration is started with very apt words as the "thought of the day". Then the students pledge to work for the goodwill of the country. Then the quiz is conducted in order to enhance the awareness of the students about the constitution. Then the speeches are conducted upon the topics like how

constitution was formed? Who framed it etc? At last children recite national anthem and pray for the development of nation.

Q8 : Here are different opinions ---------- factors?

a) Democracy ---------- British rule.

Ans : Though I would acknowledge many good things were learnt from British ruler's and Democracy being one of them. I wouldn't say that democracy was a gift given by them Indian's had made sacrifices and struggled a lot attain freedom from British rule.

b) Freedom ---------- but democratic.

Ans : Yes, free India could not be anything but democratic because the people had already suffered a lot under the British rule. This made them realize that for people to have a say in ruling the country. It was necessary to make India a democratic country.

c) We were lucky ---------- these leaders.

Ans : It is indeed true that we are lucky to have leaders who had deep democratic values. It is because of these ideals that Indian's freedom struggle can be considered as the only example of the bloodless freedom struggle in the contemporary history. Therefore absence of such ideals has made many countries democratic.

Q9 : Read the following ---------- constitutional values?

Ans : The given paragraph doesn't reflect the underlined value in our constitution. It refers to the patriarchal views and endorses the thought of inequality in genders. In this paragraph the women are shown as inferior, unequal, weak and fragile who should serve men. However the constitution has provided equal rights to women. They enjoy right to vte, can take up any job and are paid equal wages for the same work.

Q10 : Read the ---------- not true.

a) The authority ---------- other law.

Ans : not true, an ordinary law is passed by parliament & can be charged on its own will. On the other hand the rules of constitution has greater authority & the parliament has to abide by them.

b) Constitution ---------- be formed.

Ans : True, the constitution has laid down the frame work for the govt. formation. It has put in place the structure, power and functions of the three organs of govt. i.e., the enactive, legislative & judiciary.

c) Rights of citizen ---------- constitution.

Ans : True, the rights of citizen are laid down in the constitution as fundamental rights which are enforceable by law.

d) A constitution is about ---------- not values.

Ans : Not true, the constitution is the supreme law of country. It lays down the compositions, powers, functions of various institutions of govt.

Topic4 : Drainage

Q2: i. What is meant by a water divide? Give an example.

Ans. Water divide is an elevated land such as a mountain or upland which separates two adjoining drainage basins. For example, the upland at Ambala (Haryana) is the water divide because it separates the Indus drainage system from the Ganga drainage system. The Indus drains into the Arabian Sea and the Ganga into the Bay of Bengal. Similarly the Western Ghats are the main water divide in Peninsular India.

ii. Which is the largest drainage basin in India?

Ans.The Ganga-Brahmaputra is the largest drainage basin in India.

iii. Where do the rivers Indus and Ganga have their origin?

Ans.The river Ganga originates as Bhagerathi from Gangotri glacier while as the river Indus originates from the Glacier of Kailash range near the Mansarowar Lake in Tibet.

iv. Name two headstreams ……..form the Ganga?

Ans.The two headstreams of Ganga are the Bhagirati and Alakanda.

They meet at devaprayag in Uttara-Khand to form Ganga.

v. Why does ……despite a longer course?

*Ans.*In Tibet the river Indus known as Tasang-po carries a smaller volume of water and less silt as it is a cold and dry area. In India the river carries a large volume of water and considerable amount of silt because it passes through a region of high rainfall. .

vi. Which two Peninsular rivers flow through troughs?

Ans.The Narmada and the Tapi rivers flow through troughs.

vii. State some economic benefits of rivers and lakes./ Why are rivers important for country's economy?

Ans. ***Importance of Rivers*****:** India is known as the country of rivers because there are more than 1000 rivers in India. Rivers are considered the life lines of Human Civilization. The valleys of rivers are plain surfaced, very fertile and ideal for agricultural activities. All the early civilizations of the world like the Indus Valley Civilization, the Chinese Civilization, the Mesopotamian Civilization etc. developed and flourised near the river valleys. Rivers provide water for irrigation, domestic purposes, inland navigation and many industries. River water is harnessed for the generation of hydro electricity. River water is also used for fish culture.

b. Importance of Lakes**:** The importance of Lakes can be understood from the following points:-

i) Fresh water lakes are used for drinking purposes.

ii) Lakes provide habitat to aquatic plants and animals which in turn provide food for many terrestrial animals.

iii) Lakes are used for fishing, water transport, recreation and tourism.

iv) Lakes are used for developing hydal power.

Q3**:- Below are given ……..human beings.**

a. Wular (Natural)
b. Dal(Natural)
c. Nanital(Natural)
d. Bhimtal(Natural)
e. Gobidsagar (Human beings)
f. Loktak(Natural)
g. Barapani(Natural)
h. Chilika(Natural)
i. Sambhar(Natural)
j. RanaPratabSagar(Natural)
k. NizamSagar (Human beings)
l. Puliat(Natural)
m. NagarjunaSagar (Human beings)
n. Hirakund (Human beings)

Q4:- ***Discuss the significant difference between the Himalayan and the Peninsular Rivers.***

Ans. a. ***Himalayan Rivers:***The rivers which originate from the Himalayan Mountains are called the Himalayan rivers. They are also known as perennial rivers because they flow permanently throughout the year. These rivers receive water from glaciers and seasonal rainfall e.g. The Ganga, The Brahmaputra, The Indus, etc.

b. Peninsular Rivers:The rivers which originate from the Peninsular part of India are known as Peninsular rivers. They receive water during the rainy season. During dry season, these rivers have reduced flow of water in their channels. These rivers have shorter and shallow courses as compared to the Himalayan Rivers. They are also known as non-perennial or seasonal or rainfed rivers e.g. The Mahanadi, The Godavari, The Krishna, etc.

Q5:- Compare the east flowing and west flowing rivers of Peninsular plateau.

	West flowing rivers	***East flowing rivers***
1	These rivers flow westward very swiftly and merge into the Arabian sea.	These rivers flow eastward and fall into the Bay of Bengal.
2	Except the Narmada and the Tapi, these rivers have small course	These rivers have long course and large basins.
3	These rivers form estuaries.	These rivers form deltas at their mouths.
4	The west flowing rivers are Narmada, Tapi, Mahi, Puner.	The east flowing rivers are the Mahanadi, the Godavari, The Krishna, The Cauvery etc.

Q6:- Why are rivers important for the country economy?

Ans. Rivers are important for country's economy because water from the river's is a basic natural resources essential for various human activities like:-

1. Rivers provide water for irrigation. They provide fertility to soil.
2. Rivers are useful for navigation.
3. Rivers help in generation of hydroelectricity.
4. Rivers help in developing tourism.
5. Rivers provide water for domestic uses and provide livelihood to fisherman
6. Rivers help to moderate the climate and environment of the nearby areas.

Chapter no. 3 Electoral politics

1. Which of the following statements about the reasons for conducting elections are false?

(a) Elections enable people to judge the performance of the government.

(b) People select the representative of their choice in an election.

(c) Elections enable people to evaluate the performance of the judiciary.

(d) People can indicate which policies they prefer.

Answer ☹c) Elections enable people to evaluate the performance of the judiciary.

2. Which of these is not a good reason to say that Indian elections aredemocratic?

(a) India has the largest number of voters in the world.

(b) India's Election Commission is very powerful.

(c) In India, everyone above the age of 18 has a right to vote.

(d) In India the losing parties accept the electoral verdict.

Ans :a) India has the largest number of voters in the world.

3. Match the following:

Answer:

(a) It is necessary to keep the voters' list up to date because (iv) some people may have moved away from the area where they voted last

(b) Some constituencies are reserved for SCs and STs so that (i) there is a fair representation of all sections of our society

(c) Everyone has one and only one vote so that (ii) everyone has equal opportunity to elect their representatives

(d) Party in power is not allowed to use government vehicles because (iii) all candidates must have a fair chance of competing in elections

4. List all the different election related activities mentioned in the chapter and arrange them in a time sequence, beginning with the first activity and ending with the last. Some of these activities are given below: releasing election manifestos; counting of votes; making of voters' list; election campaign; declaration of election results; casting of votes; ordering of re-poll; announcing election schedule; filing nomination.

Answer :Making of voters' list → Announcing election schedule → Releasing election manifesto → Election campaign → Filing nomination → Casting of votes → Ordering of re-poll → Counting of votes → Declaration of election results.

5. Surekha is an officer in-charge of ensuring free and fair elections in an assembly constituency in a state. Describe what should she focus on for each of the following stages of election:

(a) Election campaign

(b) Polling day

(c) Counting day

Answer: (a) She will have to focus on various duties such as ensure that candidates cannot bribe or threaten voters, expenditure limit is not crossed by a candidate, candidates do not appeal to vote in the name of religion or caste, they do not use worship place for campaign or use any government resources.

(b) She will have to crosscheck the voters' list and check ID proof of the voters. Ensure booth capturing does not take place. Ensure that Free and fair election should be conducted.

(c) She have to look how counting is carried out. Ensure that representatives of all parties are present at counting area in order to avoid malpractices.

6. The table below gives the proportion of different communities among the candidates who won elections to the US Congress. Compare these to the proportion of these communities in the population of the US.Based on this, would you suggest a system of reservations in the US Congress? If yes, why and for which communities? If no, why not?

(For table plz refer to the text book page no. 53)

Answer : Blacks and Hispanics should be given reservation in the US Congress as per their percentage in the US population.

7. Can we draw the following conclusions from the information given in this chapter? Give two facts to support your position for each of these.

(a) Election Commission of India does not have enough powers to conduct free and fair elections in the country.

(b) There is a high level of popular participation in the elections in our country.

(c) It is very easy for the party in power to win an election.

(d) Many reforms are needed to make our elections completely free and fair.

Answer a) The Election Commission of India is powerful enough to conduct free and fair elections:

→ It implements the code of conduct and punishes any candidate or party that violates it.

→ In Elections, Government officials work under the EC and not the government.

(b) There is a high level of popular participation in the elections:

→ Voter turnout has increased over the past years.

→ Election-related activities in the last few years have seen a larger participation by the people.

(c) It is not very easy for the party in power to win an election:

→ The ruling parties routinely lose elections.

→ Candidates who are known to spend a lot of money often lose elections.

(d) Certain Reforms are necessary to make our elections completely free and fair:

→ To ensure that indepents and small parties not suffer in elections.

→ To ensure candidates with criminal records do not participate in elections.

8. Chinappa was convicted for torturing his wife for dowry. Satbir was held guilty of practicing untouchability. The court did not allow either of them to contest elections. Does this decision go against the principles of democratic elections?

Answer :This decision does not go against the principles of democratic elections. Any person who is convicted for a crime has no right to contest the election.

9. Here are some reports of electoral malpractices from different parts of the world. Is there anything that these countries can learn from India to improve their elections? What would you suggest in each case?

(a) During an election in Nigeria, the officer in charge of counting votes deliberately increased the votes of one candidate and declared him elected. The court later found out that more than five lakh exercised votes cast for one candidate were counted in favour of another.

(b) Just before elections in Fiji, a pamphlet was distributed warning voters that a vote for former Prime Minister, MahendraChaudhry will lead to bloodshed. This was a threat to voters of Indian origin.

(c) In the US, each state has its own method of voting, its own procedure of counting and its own authority for conducting elections. Authorities in the state of Florida took many controversial decisions that favoured Mr. Bush in the presidential elections in 2000. But no one could change those decisions.

Answer: (a) In this case, representatives of each candidate should be present to make sure that the votes are counted in a fair way.

(b) The election commission should set up an enquiry into the case and debar the candidate or party involved in distributing such pamphlets.

(c) There should be a single election commission which should be free from political influence and should be responsible for conducting elections throughout the country

10. Here are some reports of malpractices in Indian elections. Identify what the problem in each case is. What should be done to correct the situation?

(a) Following the announcement of elections, the minister promised to provide financial aid to reopen the closed sugar mill.

(b) Opposition parties alleged that their statements and campaign was not given due attention in Doordarshan and All India Radio.

(c) An inquiry by the Election Commission showed that electoral rolls of a state contain name of 20 lakh fake voters.

(d) The hoodlums of a political party were moving with guns, physically preventing supporters of other political parties to meet the voters and attacking meetings of other parties.

Answer : (a) After announcement of election, it is not legal to announce policy decisions according to Code of Conduct. The minister should be immediately taken to task by the Election Commission.

(b) The election commission must ensure that all political party are given equal opportunity to appear on Doordarshan and All India Radio. EC can take action against misuse of this media.

(c) The presence of the fake voters means that the elections were rigged by the authorities who prepared the electoral rolls. The election commission should supervise preparation of fresh electoral rolls.

(d) By using hoodlums, the political party is terrorising its rivals. The election commission should order the arrest of the hoodlums and bar the party from the elections.

11. Ramesh was not in class when this chapter was being taught. He came the next day and repeated what he had heard from his father. Can you tell Ramesh what is wrong with these statements?

(a) Women always vote the way men tell them to. So what is the point of giving them the right to vote?

(b) Party politics creates tension in society. Elections should be decided by consensus not by competition.

(c) Only graduates should be allowed to stand as candidates for elections.

Answer: (a) The statement is wrong because the policy of secret ballot ensures that an individual can vote for whoever he/she wants. Women are fully capable of taking decisions on their own and selecting the candidate they like.

(b) Competition works as both deterrent and motivator for the political candidates. A fear of losing the election and a motivation for winning the elections works in favour of people.

(c) Educational qualification is not required to understand the people's needs, and to represent their interests. Therefore, it is not necessary for politicians to be graduates.

Chapter 3 Nazism and the Rise of the Hitler

Q1. Describe the problems faced by the Weimar Republic.

Ans: The defeat of Imperial Germany at the hands of the Allied powers in World War I led to the abdication of the emperor Wilhelm II. This gave an opportunity for to parliamentary parties to recast the German polity.

Thus a National Assembly met at the town of Weimar to form a republic with a democratic constitution and a federal structure. But this newborn republic was not well received by its own people for the following reasons:

(I) The Allied imposed a harsh and humiliating treaty at Versailles, which squarely placed the blame of starting World War I on German soldiers. It was the Weimar Republic that signed the treaty much to the displeasure of the German populace.

(II) Germany lost all of its overseas colonies and a tenth of its population, along with 75% of its iron and 26 % of its coal to France, Poland, Denmark and Lithuania.

(III) The War Guilt Clause held Germany responsible for the war and the subsequent damage it caused in the Allied nations. They were forced to pay a compensation of £6 billion in total. Due to the loss of most of its revenue-generating colonies, Germany was unable to repay the amount.

(IV) Due to the failure to pay compensation, The Allied Armies occupied the resource-rich Rhineland for a time. The Weimar Republic reacted to this by printing paper currency in large numbers to pay off the huge debt. This led to hyperinflation and the eventual collapse of the economy.

Q2. Discuss why Nazism became popular in Germany by 1930.

Ans: The end of World War I had changed the political landscape of Germany. Right from the beginning, the infant Weimar Republic was beset by problems.

(I) The harsh Versailles Treaty was a serious blow to the national prestige of the Germans and to the economy

(II) The economic situation was worsened by the Great Depression of 1929, which had severely affected the already fragile German economy. The

inability of the Weimar Republic to remedy the situation only further inflamed public sentiments.

(III) The political scenario was not any better as the various political factions, such as the communists and socialists fought with each other that stalled any policy that would uplift the plight of the German people.

(IV) It was in this background that Hitler would organise the fledgling National Socialist German Worker's party, otherwise known as the Nazi party into a mass movement.

(V) By implementing Nazi ideals, Hitler promised to undo the injustice of the Versailles treaty and restore the dignity of the German people, promising economic security and to build a strong German nation free from all foreign influences and 'conspiracies'.

(VI) He found strong support among the German middle class, who were threatened with destitution due to economic collapse that had shut down banks, businesses and factories.

(VII) Nazi propaganda, along with Hitler's powerful oratory skills, successfully portrayed Hitler as a saviour and Nazism as the means to deliver the German people from the distress of living in a time of acute economic and political crisis.

Q3: What are the peculiar features of Nazi thinking?

Ans:The Nazi thinking was synonymous with Hitler's worldview. The features of such thinking are as follows:

(I) There was no equality among human race, only a racial hierarchy – with the blonde, blue-eyed, Nordic German Aryans being at the top and the Jews being placed at the bottom level. All the other coloured people were placed somewhere in between, depending on their external features.

(II) The other aspect of Nazi ideology was the concept of Lebensraum or living space. It was believed that new territories had to be acquired at the expense of the local population in order to enhance material resources and the power of the German nation.

(III) They believed in the survival of the fittest, which was a twisted version of Charles Darwin theory about natural selection. In their version, they

believed that the strongest race would survive, while the weak would perish.

(IV) Nazi thinking put much emphasis on 'racial purity'. This meant that anyone born with physical and mental disabilities was considered 'undesirable' and impure. Allowing their existence would only pollute the German race and hence they had no right to exist. Along with Jews, Gypsies, Slavic and blacks were all considered subhuman and executed in large numbers under the shadow of World War II.

(V) Nazis believed in war and aggression. Any notion of peace or related ideologies were considered weak by their standards. They believed that world domination through war justified in proving the superiority of the German race.

Q4:Explain why Nazi propaganda was effective in creating a hatred for Jews

Ans: The Nazis were quite effective in using propaganda to great effect. They made propaganda films to fan hatred for Jews with the most infamous being The Eternal Jew . Orthodox Jews were stereotyped and marked. They were shown with flowing beards, wearing kaftans and were referred to as rats and vermins who fed off from good Germans.

Jews were also blamed for Germany's defeat in World War I, despite the fact that a large number of them served with distinction in the conflict. The propaganda by the Nazis effectively worked on the minds of the people, making use of the centuries of anti-Semitic feelings and tapping their emotions. This turned their hatred and anger at those who were blamed for all of Germany's past and present ills and the Nazis would be the remedy for these 'ills'

Q5: Explain what role of women in Nazi society. Return to Chapter 1 on the French Revolution. Write a paragraph comparing and contrasting the role of women in the two periods.

Ans: Women in Nazi society were relegated to housewives who were charged with upholding the honour of the German race by limiting contacts with 'undesirables' and raising as many as pure-blooded children as possible. Those who conformed to this role were given favoured treatment in hospitals, concessions in shops, theatre tickets and railway fares. Despite Hitler's statement on 'women being the most

important citizen', it did not apply to every woman, especially those who deviated from Nazi ideology. Women who kept contacts with `undesirable` risked public humiliation, loss of civic honour, loss of family, jail sentence and even death.

This was in total contrast to the role of women in the French Revolution, where women led movements and fought for the right to education and the right to equal wages as men. They could not be forced to marry against their will. They could also train for jobs, become artists or run small businesses. Schooling was made compulsory for them and they could even hold property.

Q6. In what ways did the Nazi state seek to establish total control over its people?

President of the Weimar Republic Paul Von Hindenburg made Hitler the chancellor of Germany. Shortly after, a mysterious fire broke out in the Reichstag, the parliament building of Germany. Blaming the act of arson on communists and other enemy of the state, Hitler passed the First Fire decree in 1933 which suspended the civic rights like freedom of speech, press and freedom of assembly. Thus, Hitler effectively started controlling the German population. Other measures he undertook to systematically dismantle democracy in Germany were:

1) The Enabling Act' was passed, which gave all powers to Hitler to sideline the parliament and rule by decree.
2) All political parties, with the exception of the Nazi Party, were banned. The members of these banned parties were either imprisoned, exiled or assassinated.
3) The communists were eradicated, with the remaining members being sent to concentration camps
4) Special security forces such as the SA, SS, SD and Gestapo were created to control and order society in ways that the Nazis wanted. These organisations were given extra-judicial powers.
5) In schools, children were taught to be loyal and submissive. They were also taught to hate Jews and worship Hitler. Thus, cultivating a personality cult in the process.
6) Nazi youth organizations, the like 'Jungvolk' and 'Hitler Youth' were created, where the youth were taught to hate democracy, communism, Jews and other 'undesirables'.

Economics

Chapter 1 Money and Banking

Very short/short type questions:

Q: What is Double coincidence of wants? Explain with an example of your own.

Answer: 'Double coincidence of wants' is when whatever a person desires to sell is exactly what the other wishes to buy. In a barter system where goods are directly exchanged without the use of money, double coincidence of wants is an essential feature for example, a trader wishes to sell 10 sacks full of rice and expects to get it in exchange for five sacks of cereal. To find a suitable buyer to sell the sacks of rice in exchange for cereals would be very tough. However, the money will solve this problem and the trader can sell the sacks of rice to someone who needs it and in return buy cereals from the money he gets from the buyer of rice.

Q: Can you think of some examples of good services being exchanged or wages being paid through barter ?

Answer: Yes, in rural areas generally crops and food-grains are directly exchanged without the use of money. Similarly, agricultural labourers are normally paid not in cash but in kind, e.g. 5kg wheat or rice per day.

Q: Why money is called a medium of exchange?

Answer: Since money acts as an intermediate in the exchange process, it is called a medium of exchange.

Q: Who is authorised to issue a currency in India?

Answers :The Reserve Bank of India is authorised to issue currency notes on behalf of the government.

Q. Why can no one refuse a payment made in rupees?

Answer: One cannot refuse a payment made in rupees because, by law, the central Bank issues currency notes on behalf of the central government. The law legalizes the use of rupee as a medium of payment which cannot be refused in settling transactions.

Q. Why are the deposits in the bank accounts called deposits?

Answer: People deposit their savings in bank accounts. They can withdraw their money whenever required. Because the deposits in the bank account can be withdrawn on demand, these deposits are called deposits. Deposits also act as direct money in case of cheque payments.

Q. How do banks mediate between those who have surplus money and those who need money?

Answer: Banks mediate between those who have surplus funds (the depositors) and those who are in need of funds (the borrowers) by lending money to people who are in need. People can open accounts in banks and banks make use of that money to fulfil the loan requirements of the people. A higher interest rate is charged for the borrower and that profit is given to the depositor as interest for offering deposit

Q: Define a cheque.

Answer: A cheque is a paper instructing the bank to pay a specific amount from the person's account to the person in whose name the cheque has been made.

Q: Define a loan.

Answer: Loan is a debt provided by one entity to another entity at an interest rate, and evidence by a note which specifies, among other things, the Principal amount, interest rate, and date of repayment. A loan entails the reallocation of the subject assert (s) for a period of time, between the lender and the borrower.

Q. Why do lenders ask for a collateral while lending?

Answer:Lenders ask for collateral while lending because if payment of interest and repayment of the principal amount are not make on time, as the last resort the lenders can sell the collateral assets and recover their money.

Long Answer type questions:

Q: What are various forms of modern money?

Answer: In the modern monetary system, there are three forms of money in actual use:

- Metallic money
- Proper money
- Credit money.

The first two kinds of money are in the form of currency, money and the last one is credit or bank money.

Metallic Money:-Metallic money refers to coins made out of various metals like gold, silver, bronze, nickel, etc. Since all types of coins are issued by the state authorities either the treasury or the Central Bank of the country they are regarded as legal tender.

Paper Money:- Paper money consists of currency notes issued by the state. Treasury or the Central Bank of the country. In India, one rupee notes are issued by the Ministry of Finance of the government of India, while all other currency notes of higher denominations are issued by the Reserve Bank of India.

Credit Money:- In modern economic societies, with the development of banking activity, along with paper money, another form of convertible money has developed in the form of credit money or bank.

Q: What is the procedure of opening a Savings Bank account?

Answer: Following are the steps to open a savings Bank account:-

- Choose a bank in which you want to open an account:- This steps involves choosing or selecting a bank with which a person wants to open an account.
- Fill up the prescribed application form:- Every bank has a prescribed application form to be filled up for opening an account. The application involves information regarding name, residence and space for fixing a photograph.
- Submit the filled up application form:- The filled up application form is to be submitted to the bank officer. After scrutiny of the same, the bank may issue an account number.
- Receive necessary documents from the bank:-After completion and successful submission of the form the Bank issues an account number. Bank also provides a small book known as passbook which contains particulars of the account holder.

Q: How can you withdraw money from a savings Bank account?

Answer: The cash can be withdrawn by two producers:-

- By visiting the branch.
- By using ATM (Automated Teller Machine).

1: By visiting the branch:

By filling withdrawal form:- The person has to present himself personally and fill up the withdrawal form.

By Cheque:- The cheques can be signed and issued by the account holder on the concerned bank. The bank will issue cash against such cheque.

2. By using ATM:- It is a machine controlled procedure. A person, on opening an account, is provided with a card which can be used to withdraw cash by inserting in ATM.

Q: What are various forms of plastic money?

Answer: Plastic money can come in many different forms, such as cash cards, prepaid cash cards and store cards.

A Debit card also known as a bank card is a plastic card that provides the card holder electronic access to his or her bank account. The card, where accepted, can be used instead of cash when making purchases. Mostly the debit card is used for ATM transactions.

A Credit card allows the cardholders to pay for goods and services based on the holder's promise to pay for them. The issuer of the card creates a revolving account and grants.

Q: Explain the various credit and loan activities of Banks with an example?

Answer: The people deposit their surplus funds with the banks and Banks besides providing security, pay interest to the depositors. The Bank keeps only a small portion of their deposits as cash with themselves. The balance of deposits is then lent out to those who are in need of money. To make things simple, let us think that there is only one bank in the economy. Let the banking authority has decided that the cash reserve ratio is 20%. So, the banks must keep 20% of its current deposit in the form of cash to make cash payments to persons who come to withdraw money.

ECONOMICS

Chapter 2

Understanding Indian Economy

Very short/ Short type questions:

Q: What are the various activities undertaken in the primary sector, secondary sector and tertiary sector?

Answer: Primary sector comprises activities related to the extraction and production of natural resources. Agriculture, forestry, animal husbandry, fishing, poultry farming, mining and quarrying are the activities undertaken in this sector.

Secondary sector comprises activities related to the processing of natural resources. Manufacturing is included in this sector.

Tertiary sector comprises activities that provide support to the primary and secondary sectors through various services. Trade, transport, communication, banking, education, health, tourism, insurance, etc. are examples of tertiary activities.

Q: What do you understand by ‘People as a resource'.

Answer: “People as Resource” is a way of referring to a country’s working people in terms of their existing productive skills and abilities. Human resource is an asset for the economy rather than a liability. Population becomes human capital when there is investment made in the form of education, training and medical care.

Q: Explain the term poverty Line.

Answer: Poverty line is the level of income to meet the minimum living conditions. Poverty line is the amount of money needed for a person to meet his basic needs.

Q: What is Buffer Stock.

Answer: Buffer stock refers to an amount of physical stock which the Government keeps on hand to protect against unexpected supply and demand variations.

Q: What is meant by ‘Food for work’ programme?

Answer:Food for Work’ programme was started in 1970s to raise the standard of living of poor. This is poverty alleviation programme aimed to raise income and employment for the poor through the creation of incremental assets and by means of work generation. This programme wanted to ensure goods instead of money.

Long answer type Questions:

Q: What is Gross Domestic product? How is it calculated? Describe the contribution of three sectors to the GDP of the Indian Economy.

Answer: Gross Domestic Product (GDP) is the market value of the final goods and services produced during a year within the domestic territory of a country.

Here only final goods and services are counted to avoid the problem of double counting.

For e.g. a farmer sold wheat to flour mill for Rs. 10 per kg. The mill grinds the wheat and sold the flour to a biscuit company for Rs. 12 per kg. The biscuit company uses the flour, sugar and butter to make 5 biscuit packets. He sold the biscuit to the consumer at Rs. 15 per biscuit packet.

Here biscuits are the final goods that are purchased by the consumer. Wheat and wheat flour are the intermediate goods used in the production of final good.

The value of Rs. 75 already includes the value of flour Rs. 12.

Hence only the value of final goods and services.

Therefore, GDP = Value of output – Intermediate Consumption

Contribution:Indian GDP composition in 2017 are as follows : Agriculture (primary sector)(15.4%), Industry (industrial sector) (23%) and Services (Tertiary sector) (61.5%).

Q: What are the various forms of unemployment.

Answer: Unemployment may be defined as “a situation in which the person is capable of working both physically and mentally at the existing wage rate, but does not get a job.”

Types of Unemployment :

1. Open Unemployment:Open unemployment is a situation where in a large section of the labour force does not get a job that may yield them regular income.
2. Disguised Unemployment:It is a situation in which more people are doing work than actually required. Even if some are withdrawn, production does not suffer.
3. Seasonal unemployment: It is unemployment that occurs during certain seasons of the year. In some industries and occupations like agriculture, holiday resorts, ice factories etc., production activities take place only in some seasons. So they offer employment for only a certain period of time in a year. People engaged in such type of activities may remain unemployed during the off-season.
4. Cyclical Unemployment:It is caused by trade cycles at regular intervals. Generally capitalist economies are subject to trade cycles. The down swing in business activities results in unemployment. Cyclical unemployment is normally a shot-run phenomenon.
5. Educated Unemployment:Among the educated people, apart from open unemployment, many are underemployed because their qualification does not match the job. Faulty education system, mass output, preference for white collar jobs, lack of employable skills and dwindling formal salaried jobs are mainly responsible for unemployment among educated youths in India.

Q: Define poverty. Explain four important anti poverty measures undertaken by the government of India.

Answer:Poverty is a state or condition in which a person or community lacks the financial resources and essentials for a minimum standard of living.

Schemes:-

1.National Food for Work Programme or NFWP

This scheme is open for the rural people who are willing to do manual unskilled work. They are given food grains in lieu of wages. This scheme has been implemented in 150 most backward states.

2.Swarnajayanti Gram SwarozgarYojana or SGSY

It grants bank credit and government subsidy to poor families who are organized into self help groups. This gives them a chance to rise above the poverty line.

3. PradhanMantriGramodayaYojana or PMGY

The states are given assistance for basic services like primary health, rural shelter, primary education, rural electrification and rural drinking water.

4.Antyodaya Anna Yojana or AAY

According to this scheme subsidized food is provided to millions of the poorest families.

Q: Define food security. Describe the three dimensions of food security.

Answer:Food Security, means that all people, at all times, have physical, social, and economic access to sufficient, safe, and nutritious food that meets their food preferences and dietary needs for an active and healthy life.

Three dimensions of food security:

Availability of food: This means the food production within the country, food imports and previous years' stock stored in government granaries.

Accessibility of food: This means food should be within reach of every person.

Affordability: This means that every individual has enough money to buy sufficient, safe and nutritious food to meet one's dietary needs.

اُردو

جماعت:نویں حصہ اول

انسان کامل از خواجہ غلام السیدین

سیرت پاک سے کیا مراد ہے؟

سیرت کے لغوی معنی عادت یا خصلت یا وصف یا ہنر یا طریقہ یا راستہ کے ہیں۔ یہ لفظ زندگی کے حالات و واقعات کے بارے میں استعمال کیا جاتا ہے۔حضور اکرم ﷺ کی زندگی اور حالات کے بارے میں جو کچھ بتایا یا لکھا جاتا ہے اسے آپ ﷺ کی سیرت کہتے ہیں۔اور یہی پاک سیرت اہل ایمان کے لئے نمونے کا کام دیتی ہے اور زندگی کے ہر شعبے پر اس کا اطلاق ہوتا ہے۔

حضور پاک ﷺ کی سیرت قرآن اور تعلیمات اسلامی کا مکمل نمونہ ہے اور آپ ﷺ نے جو فرمایا خود کر کے دکھایا اسی لئے اسلام کو عملی مذہب کہا جاتا ہے۔اور تمام مسلمان حضور حقؐ کی پیروی اور سنت کو اپنانے میں خوشی و راحت تسلیم کرتے ہیں اور باعثِ ثواب و نجات بھی ہے۔

چنانچہ اسلام کی ابتدائی دور سے آج تک آپ ﷺ کی پاک سیرت پر بے شمار کتابیں لکھی گئی ہیں اردو میں مولانا شبلی نعمانی، سید سلیمان ندوی، ابوالحسن علی ندوی، ماہر القادری اور دیگر بہت سے ادباء اور علماء نے سیرت پر کتابیں لکھی ہیں۔

کتابی سوالات کے جوابات

جواب(۱) آپ ﷺ کی ابتدائی زندگی کا پس منظر غور کرنے کے قابل ہے۔اس میں ایسے ظاہری اسباب وحالات نہیں ملتے جو ابتدائی تربیت میں مددگار ہوتے ہیں۔آپؐ کی پیدائش سے چند ماہ پہلے آپؐ کے والد صاحب کا انتقال ہوجاتا ہے اور ابھی آپؐ کی عمر چھ سال کی بھی نہیں تھی کہ شفیق ماں کا سایہ سر سے اٹھ جاتا ہے۔اب آپؐ کی نگرانی آپؐ کے دادا کے حصے میں آتی ہے۔لیکن اس نئی ولایت کو دو سال بھی نہیں گزرے کہ یہ سایہ بھی سر سے اُٹھ جاتا ہے۔غرض آپؐ کو زندگی کے ابتدائی دور میں انتہائی محرومیوں سے سابقہ پڑا۔

جواب(۲) نوجوانی ہی میں آپؐ کی امانت داری، دیانت داری اور سمجھ داری کا شہرہ پھیل گیا۔اس شہرت سے متاثر ہوکر عرب کی ایک شریف اور بیوہ خاتون بی بی خدیجہؓ نے اپنی تجارت کا انتظام آپؐ کے سپرد کردیا اور اس فرض کو آپؐ نے ایمانداری، سلیقے اور کامیابی کے ساتھ انجام دیا۔

جواب(۳) **معرفت الٰہی:۔**

معرفت الٰہی سے مراد خدا سناسی ہے۔خدا کو حقیقت میں کسی نے نہیں دیکھا۔لیکن خدا تعالیٰ نے دنیا میں انسان کو بہت سی نعمتوں سے نوازا ہے اور اس کو اشرف المخلوقات بنا کر اپنے ہونے کا ثبوت دیا ہے۔در حقیقت خدا تعالیٰ کے معجزات کی وجہ سے انسان نے خدا کو پہچانا ہے۔اسی لئے انسان کے دل میں خدا کی محبت بھی ہے اور خوف بھی۔دراصل خدا سے سچی محبت ہی معرفت الٰہی ہے۔

خدمت خلق:۔

خدمت خلق سے مراد لوگوں کی مدد کرنا ہے۔خدا نے انسان کو اپنی عبادت کے لئے پیدا کیا ہے۔لیکن عبادت صرف نماز پڑھنا ہی نہیں ہے بلکہ دوسروں کے کام آنا بھی عبادت ہے۔غریبوں اور محتاجوں کے کام آنا، ماں باپ کی خدمت کرنا سب سے بڑی عبادت ہے اور اسی خدمت کا دوسرا نام خدمت خلق ہے۔

تکمیل خالی جگہیں:۔

قدرت ، روشن ، گمراہی ، منظر ، چوٹ

گرائمر:۔

الف) الفاظ: دیکھ ، جا ، کھا ، آ ، سو ، پی ، پڑھ ، لکھ ، لا ، بیٹھ

مصادر: دیکھنا ، جانا ، کھانا ، آنا ، سونا ، پینا ، پڑھنا ، لکھنا ، لانا ، بیٹھنا

ب) مصادر: بیٹھنا ، گھومنا ، روٹھنا ، سنوارنا ، چمکنا ، بولنا، تولنا

افعال امر: بیٹھ ، گھوم ، روٹھ ، سنوار ، چمک ، بول ، تول

ج) واحد: سبب ، مقصد ، فرض ، حالت ، منظر ، معلم ، نقش ، روح

جمع: اسباب ، مقاصد ، فرائض ، حالات ، مناظر ، معلمین ، نقوش ، ارواح

تعریف غزل

غزل کے معنی ہیں عورتوں کے متعلق باتیں کرنا۔اصطلاح شعر میں غزل ان اشعار کو کہتے ہیں جو ایک وزن اور ایک ہی قافیہ میں ہوں۔غزل کے پہلے شعر کے دونوں مصرعے ہم قافیہ ہوتے ہیں۔اسے مطلع کہتے ہیں۔مطلع کے بعد والے شعر کے پہلے مصرعہ میں قافیہ کی قید نہیں رہتی۔اگر اس میں بھی پہلے مصرع میں قافیہ کی پابندی کی جائے تو اسے حسن مطلع یا زیب مطلع کہتے ہیں۔آخری شعر میں شاعر اپنا تخلص استعمال کرتا ہے۔اس کو مقطع کہتے ہیں۔

غزل کے ہر شعر کا مطلب جدا گانہ ہوتا ہے۔مگر ایسی غزلیں بھی ہیں جو ایک ہی مضمون کو مسلسل پیش نظر رکھ کر کہی گئی ہیں اور ایسی غزل کو غزل مسلسل کہتے ہیں۔کبھی کبھی غزل میں صرف دو تین ہی اشعار مسلسل ہوتے ہیں۔ایسے اشعار کو قطعہ کہتے ہیں۔

غزل کا سب سے اچھا شعر بیت الغزل یا شاہ بیت کہلاتا ہے۔جس غزل میں ردیف نہ ہوں اور صرف قافیے ہوں اس غزل کو غیر مردّف کہتے ہیں۔وہ بحر اور ردیف و قافیہ جس کے لحاظ سے غزل کہی جاتی ہے اسے غزل کی زمین کہتے ہیں۔

اردو میں غزل فارسی سے آئی۔اس لئے اس کے مضامین میں بھی زیادہ تر فارسی کی ہی تقلید کی گئی۔قدیم شعراء غزل کو صرف عشقیہ مضامین تک محدود رکھتے تھے۔مگر بعد کے اساتذہ نے اس میں تصوّف ، فلسفہ، وعظ اور اخلاقی مضامین کے علاوہ معاشرتی، سماجی غرض انسانی زندگی کے متعلق سارے معاملات اس میں داخل کر دئے۔

غزل کی زبان شیرین اوشستہ ہونا ضروری ہے۔مشکل الفاظ اورتراکیب کا استعمال غزل کے لئے جائزنہیں ہے۔غزل کے اشعار کی تعداد مقررنہیں۔کم سے کم پانچ اور زیادہ سے زیادہ اکیس (۲۱) اشعار کی غزلیں بھی لکھی گئی ہیں۔غزل اردوشاعری کی سب سے زیادہ عام پسنداورمحبوب صنف سخن ہے۔

فراق گورکھپوتی

غزل نمبر(۱)

رکی رکی سی شب مرگ ختم پر آئی وہ پوپھٹی وہ نئی زندگی نظر آئی

فراق کہتے ہیں کہ فرنگی نظام خاتمے پرآرہا ہے۔وہ نظام جس وجہ سے ہمیں افسردگی کے سوا کچھ حاصل نہ ہوادم توڑرہا ہے۔نئی صبح یعنی آزادی کی شروعات ہونے جاری ہے۔آزادی کی صبح اپنا نور پھیلارہی ہے۔جس نور سے ہماری زندگی روشن ہوجائے گی وہ صبح نمایاں ہورہی ہے۔

یہ موڑ وہ ہے کہ پرچھائیاں نہ دیں گی ساتھ مسافروں سے کہو اس کی راہ گزر آئی

فراقؔ کہتے ہیں کہ آزادی کی خاطراس کے دیوانوں کو بہت سی پریشانیوں اورقربانیوں سے دوچارہوناپڑتا ہے۔ حصولِ آزادی آسان ہیں۔اس کے راستے میں غیر کیا اپنے بھی ساتھ ہیں دیتے۔راہ آزادی کے پیچوخم سے گزرنا آسان نہیں۔یہ قربانیاں دیکر حاصل ہوتی ہے۔فراق آزادی کے متوالوں سے مخاطب ہوکر کہتے ہیں کہ اب تمہاری منزل قریب آگئی ہے۔تم اس راہ کے رہگیر ہوجس کی منزل آزادی ہے۔

فضا تبسم صبح بہار تھی لیکن پہنچ کے منزل جاناں پر آنکھ بھر آئی

فراقؔ کہتے ہیں کہ آزادی کی فضااس قدرحسین نظرآئی ہے جیسے بہاراپنے شباب پر ہے۔ایسامحسوس ہورہا ہے۔ جیسے منزل مقصود چندقدم کے فاصلہ پر ہے۔لیکن اس منزل کے نزدیک جب پہنچے تو آنکھوں سے آنسوں نکل آئے۔

حالات کے مشاہدے سے ظاہر تھا کہ آزادی ضرور حاصل ہوگی لیکن منزل کے قریب پہنچ کر معلوم ہوا کہ ابھی منزل بہت دور ہے۔

کسی کی بزم طرب میں حیات بٹتی تھی　　امیدواروں میں کل موت بھی نظر آئی

فراقؔ کہتے ہیں کہ آزادی کے دیوانوں کو خوشنما محفلوں سے کوئی وابستگی نہیں ہوتی ہے۔انہیں ایسی محفلوں میں کیا کام۔وہ تو آزادی کے متوالے ہیں۔وہ تو منزل مقصود یعنی آزادی کی خاطر ہر گام پر موت کا سامنا کرتے ہوئے نظر آتے ہیں۔وہ تو آزادی کی خوشی کے شیدائی ہے نہ کہ پر مسّرت محفلوں کے۔

کہاں ہر ایک سے انسانیت کا بار اٹھا　　کہ یہ بلا بھی ترے عاشقوں کے سر آئی

فراقؔ کہتے ہیں کہ خالق کائنات نے انسان کو اشرف المخلوقات بنایا اواس پر لازمی ہوگیا کہ یہ انسانیت،اخلاص اور صبر وتحمل جیسے اوصاف اپنے آپ میں پیدا کریں۔مگر ہر ایک سے انسانیت کو بوجھ نہ اٹھ سکا۔انسانیت کا بوجھ بھی انہوں نے اٹھایا جنہوں نے اپنے دلوں میں خالق کائنات کی سچی محبت کو جگہ دے دی ہے۔

غزل(۲)

سر میں سودا بھی نہیں دل میں تمنا ہی نہیں　　لیکن اس ترک محبت کا بھروسا بھی نہیں

فراقؔ کہتے ہیں کہ دل سے جنون محبت رفع ہو چکا ہے۔دل میں تمنائے محبت وفاداری باقی نہ رہی۔راہ محبت سے ہمازاگز ربھی نہیں ہوتا ہے۔اب دل سے محبت کا خیال نکال دیا ہے۔مگراس بات کا اعتبار نہیں کہ محبت سے میں نے توبہ کرلی ہو۔دل کے ہاتھوں مجبور ہوکر محبوب کے در پر دست سوال لیکر بھی جاسکتا ہوں۔

دل کی گنتی نہ بیگانوں میں　　لیکن اس جلوہ گہہ ناز سے اٹھتا بھی نہیں

فراقؔ کہتے کہ بے شک میرا محبوب مجھے نہ غیروں میں اور نہ اپنوں میں شمار کرتا ہے۔میرے محبوب کو میرے دل کی قدر ہی نہ رہی۔مگر میں اپنے دل کے ہاتھوں مجبور ہوں۔میں اس محفل سے پرے نہیں جاسکتا جس محفل میں میرا محبوب اپنے حسن کی نمائش کرتا ہے۔

مہربانی کو محبت نہیں کہتے اے دوست آہ ! اب مجھ سے تری رنجش بے جا بھی نہیں

فراقؔ کہتے ہیں کہ اے میرے دوست! محبت اور مہربانی ایسے احساس ہیں جن میں نمایا فرق ہے۔محبت مہربانی نہیں ہوتی اور مہربانی محبت نہیں ہوتی۔ میرا دوست مجھ پر مہربانی کرتا رہا اور میں محبت سمجھ بیٹھا۔ میں بھی نہایت ناداں ہوں۔اس وجہ سے میرا دوست ناراض ہوگیا اور اس کی ناراضگی واجب ہے۔

ایک مدت سے تری یاد بھی آئی نہ ہمیں اور ہم بھول گئے ہوں تجھے ایسا بھی نہیں

فراقؔ کہتے ہیں کہ اے میرے محبوب! زمانے کے حالات نے مجھے اس قدر گھیرا ہے کہ میں خود کو ہی بھلا بیٹھا ہوں۔جس کی وجہ سے میں تمہیں بھی یاد نہیں کرتا۔طویل عرصے سے میں تمہیں یاد بھی نہیں کرتا مگر اس کا یہ مطلب نہیں کہ میں نے تمہیں بھلا ہی دیا ہو۔

آہ! یہ مجمع احباب یہ بزم خاموش آج محفل میں فراق سخن آرا بھی نہیں

فراقؔ کہتے ہیں کہ دوستوں کی محفل جم گئی ہے۔مگر ویرانے کی مانند نظر آرہی ہے۔دوستوں کی محفل میں خاموشی طاری ہوگئی ہے کیونکہ اس محفل میں فراقؔ جیسا شیرین زباں، پراثر لہجہ دار اور بلند مرتبہ شاعر موجود نہیں۔جس کی وجہ سے بزم میں ویرانی اپنے شباب پر ہے۔

کتابی سوالات کے جوابات:

جواب(۱) نصابی کتاب میں فراقؔ گورکھپوری کی پہلی غزل کے دوسرے شعر میں مجموعۂ الفاظ ''مسافروں سے کہو'' میں مسافروں سے مراد وہ راہ گیر ہیں جو راہ آزادی پر نڈر رہو کر اپنی منزل مقصود کی جانب انتھک چلے جارہے ہیں۔ان مسافروں کو آزادی کے متوالے کہنا بجا ہوگا۔

جواب(۲) فراقؔ کی دوسری غزل کے مقطع میں احباب کا مجمع میں احباب کا مجمع ہونے کے باوجود بھی خاموشی طاری ہونے کا باعث فراقؔ کی غیر موجودگی ہے۔ بزم احباب میں فراقؔ جیسا شیرین زبان، پراثر لہجہ دار اور بلند مرتبہ شاعر موجود نہ ہونے کی وجہ سے ویرانی چھائی ہے۔

جواب(۳) بقول شاعر:

بات کرنے سے بات بڑھتی ہیں
روز باتیں کیا کرو ہمسم سے

درج بالا شعر کا مطالعہ کرنے کے بعد یہ کہا جاسکتا ہے کہ عاشق معشوق کے باہمی کلام سے ایک محبت کی دنیا آباد ہوجاتی ہیں۔ جب فسانۂ محبت کے بیان کیلئے عاشق معشوق زبان والفاظ کا سہارا لینے کے بجائے اشارے کنائے کا سہارا لیتے ہیں تو اس محبت کی زندگی کی ایک تصویر وتفسیر دل کی گہرائیوں میں پیوند ہوجاتی ہیں۔ ان ہی جذبات کو فراقؔ نے مرکتِ اضافی ''شرح حیات'' میں سمیٹ لیا ہیں۔

نظم "اختر الایمان"

عجم کے شہروں میں اک شہر کا ہے یہ قصہ
یہ رفت وبو کا اس سلسلہ جو قائم ہے

یہ شعر اختر الایمان کی نظم قبر سے لیا گیا ہے۔ شاعر کہتے ہیں کہ ایران کے شہروں میں ایک ایک شہر کا یہ واقعہ ہے جس کا تعلق زندگی اور موت سے ہے۔ پیدا ہونا اور مرنے کا سلسلہ اس دنیا میں قیامت تک قائم رہے گا۔

بھنور میں جس کے ہر اک چیز ڈوب جاتی ہے
سنا ہے اس میں کسی قصبے کا رئیں بڑا

شاعر کہتے ہیں کہ اسی آنے اور جانے کے چکر میں ایک انسان کی ہر ایک چیز ڈوب جاتی ہے۔ اسی آنے جانے کے چکر میں ایک امیر آدمی کا قصہ سنا ہے۔

پھنسا کچھ ایسا کوئی چال کار نہ ہوئی
ہر ایک طبی مدد ہر دوا علاج غرض

وہ آدمی اسی موت اور زندگی کی کشمکش میں کچھ اس طرح پھنسا یعنی وہ سخت بیمار ہوا۔ ہر ایک سے طبی مدد لی اور ہر ایک دوا استعمال کی۔ ہر قسم کا علاج کرایا لیکن کوئی بھی علاج فائدہ مند ثابت نہ ہوا۔

وہ سب جو قبضۂ انسان و ممکنات میں تھا
کیا تمام مسیحا قریب و دور جو تھے

جو کچھ بھی انسان کے قبضے میں تھا اور جو کچھ بھی ممکن تھا وہ سب کچھ کیا گیا۔ دور دور سے اور نزدیک کے حکیم علاج کرانے کیلئے بلائے گئے۔

طلب کئے گئے سب کو زرِ کثیر دیا
مگر خدا کو جو منظور تھا وہ ہوکے رہا

شاعر کہتے ہیں کہ تمام حکیموں کو بہت پیسہ دے کر بلایا گیا لیکن خدا تعالیٰ کو جو کرنا ہوتا ہے وہ ہی ہو کے رہتا ہے۔

اجل نے بیٹے سے محبوب باپ چھین لیا
خبر یہ پھیل گئی دور پاس پل بھر میں

اختر الایمان کہتے ہیں کہ موت نے بیٹے سے اس کا پیارا باپ چھین لیا اور اس کے مرتے ہی یہ خبر دور تک پھیل گئی۔

ہر ایک روتا تھا زار و قطار سن سن کر
پسر کے بین کا دل پر اثر شدید ہوا

جو بھی اس کو موت کی خبر سنتا تھا اور بیٹے کی آہ وزاری اور ماتم کا حال جو بھی دیکھتا تھا وہ زور زور سے روتا تھا۔

وہ سینہ پیٹ کے کہتا تھا بار بار پدر
چلے ہوا ایسی جگہ چھوڑ کر ہمیں سب کو

شاعر کہتے ہیں کہ بیٹا باپ کے غم میں رو رہا تھا اور اپنا سینہ پیٹ رہا رتھا اور کہہ رہا تھا کہ اے میرے باپ ہم سب کو بے سہارہ چھوڑ کر کہاں جا رہے ہو۔ وہ جگہ جہاں آپ جا رہے ہو وہ تنہا اور سنسان ہے۔

جہاں نہ دوست نہ ہمدم نہکوئی مونس ہے
اندھیری کو ٹھری ہوی اکیلے رہنا ہے

بیٹا روتے روتے کہتا ہیں کہ اے میرے پیارے باپ آپ ہم سب کو چھوڑ کر اس جگہ

جارہے ہو جہاں نہ کوئی دوست ہوگا اور نہ کوئی محبت کرنے والا ہوگا۔ وہاں ایک اندھیری کوٹھری رہنے کے لئے ہوگی۔

نہ کھانا پانی جہاں ہے نہ روشنی کا گزر
وہاں پہ جیدی بھی گزرے گی خود ہی سہنا ہے

شاعر کہتے ہیں کہ بیٹا روتے روتے کہہ رہا تھا کہ اے میرے شفیق باپ آپ وہاں جارہے ہیں جہاں نہ آپ کو کھانا، پانی اور نہ ہی روشنی ملے گی۔ جو کچھ بھی آپ پر بیت جائے گی صرف آپ پر ہی بیتے گی یعنی صرف آپ کو ہی سہنا ہوگا۔

ہر ایک چیز کو ترسو گے ہائے ہائے وہاں
کوئی مدد کو نہ آئے گا ایسی دنیا ہے

بیٹا آہ فغاں میں اپنے باپ سے کہتا ہے کہ وہاں آپ ہر ایک چیز کیلئے تڑپتے رہو گے اور وہاں پر کچھ بھی حاصل نہ ہوگا اور نہ ہی کوئی مدد کیلئے آپ کے پاس آئے گا۔

غریب بھی کوئی شامل تھا اس جنازے میں
اور اپنے نور نظر کو بھی ساتھ لایا تھا

اختر الایمان کہتے ہیں کہ اس امیر آدمی کے جنازے میں ایک غریب شخص بھی شامل تھا اور اس نے اپنے بیٹے کو بھی ساتھ لایا تھا۔

سنی جو آہ و بکا اس نے کچھ نہیں سمجھا پلٹ کے باپ سے پوچھا بہت ہی سادگی سے
ہمارے گھر لئے جاتے ہیں کیا انہیں بابا؟

جب اس غریب آدمی کے بیٹے نے رونا پیٹنا سنا تو اس کی سمجھ میں کچھ بھی نہ آیا۔ بیٹے نے اپنے باپ کی طرف مڑ کر پوچھا کہ اے میرے بابا کیا اس جنازے کو ہمارے گھر لئے جارہے ہیں۔

کتابی سوالات

جواب (۱)

شاعر اختر الایمان نے بذبانِ پدر رئیس، قبر کی زندگی کی تفصیل یوں بیاں کی ہے۔

قبر ایک ایسی جگہ ہے جہاں نہ کوئی دوست، نہ ساتھی اور نہ کوئی ہمدم ہوتا ہے۔ قبر ایک اندھیری کوٹھری ہے جہاں نہ کھانا، نہ پانی اور نہ ہی کوئی روشنی ہوتی ہے۔ قبر میں جو کچھ بھی ہوتا ہے اہلِ قبر کو اکیلے ہی برداشت کرنا پڑتا ہے۔

جواب(۲)

غریب کے بیٹے کو قبر کی باتیں سنکر اپنا گھر اس لئے یاد آیا کیونکہ جو باتیں اس نے قبر کے بارے میں سنی تھیں وہ حال اس کے گھر کا بھی تھا۔ اس کا گھر بھی قبر کی طرح اندھیری کوٹھری تھی جس میں نہ کھانا، نہ پانی، نہ روشنی اور نہ ہی کوئی مددگار۔ اس کے گھر اور قبر میں کوئی فرق نہ تھا۔

جواب(۳)

نظم قبر ایک طنزیہ نظم ہے جس کا طنز آخری دو مصرعوں میں ظاہر ہوتا ہے۔ اگر آخری مصرعے کو اس نظم معنی بھی کمزور ہو جائے گا۔

غزلیات عابدؔ مناوری

غزل(۱):

باطن کی آنکھ سے جو کبھی دیکھتا ہوں میں لگتا ہے جیسے خود سے بھی نا آشنا ہوں میں

غزل کے اس مطلع میں شاعر عابدؔ مناوری کہتے ہیں کہ جب بھی میں اپنی چشم بصیرت سے اپنے آپ کو دیکھتا ہوں تو مجھے ایسا لگتا ہے جیسے میں اپنے آپ سے بھی بے خبر ہوں۔ میرے محبوب کا خیال میرے دل و دماغ پر چھایا رہتا ہے جب میں دل کی اندرونی نظر سے دیکھتا ہوں۔

اس درد سے خالی ہاتھ ہی پلٹا ہے ہر کوئی دستِ سوال لے لے کہاں آ گیا ہوں میں

شاعر کہتے ہیں کہ میں نے اس دروازے پر اپنا سوال بھرا ہاتھ پھیلایا جہاں سے ہر کوئی خالی ہاتھ ہی واپس لوٹتا ہیں۔ جس دروازے پر کسی کی مراد پوری نہیں ہوتی ہے اسی دروازے پر میں نے بھی اپنا ہاتھ پھیلایا تھا۔ میرے محبوب کے دروازے سے ہر کوئی خالی ہاتھ ہی واپس آتا ہے اور کسی کی تمنا پوری نہیں ہوتی ہے۔ میں نے بھی وہ ہی غلطی کی۔

مجھ کو ہوا اڑا کے جدھر چاہے لے چلے پتا ہوں اور شاخ سے ٹوٹا ہوا ہوں میں

عابدؔ مناوری کہتے ہیں کہ جب ایک پتہ درخت کی ٹہنی سے زمین پر گرتا ہے اور پھر جہاں ہوا چلتی ہے اس پتے کو اڑا کر لے جاتی ہے۔ اسی طرح بھی ایک ٹہنی سے ٹوٹے ہوئے پتے کی طرح ہوں اور جہاں سے مصیبت کی ہوا کا رُخ ہوتا ہے وہاں مجھے اڑا لے جاتی ہے۔

مجھ سا بھی سادہ لوح زمانے میں ہے کوئی اپنی تباہیوں پہ بھی خوش ہو رہا ہوں میں

عابدؔ مناوری کہتے ہیں کہ اس زمانے میں مجھ جیسا بھی کوئی ہوگا یعنی مجھ جیسا بھی کوئی

سیدھا سادہ نہیں ہوگا کیونکہ میں اپنی ہی بربادیوں پر جشن اور خوشیاں منا رہا ہوں۔ اپنی تباہیوں پر پریشان ہونے کے بجائے میں خوش ہو رہا ہوں۔

ہے ٹھیک یا غلط میرا انداز گفتگو عابؔد جو کہنا تھا مجھے وہ کہہ گیا ہوں میں

عابؔد مناظری اپنے آپ سے مخاطب ہو کر کہتے ہیں کہ اے عابؔد! میں نہیں جانتا ہوں کہ میری بات کرنے کا طریقہ ٹھیک ہے یا غلط لیکن مجھے جو کچھ کہنا تھا وہ میں کہہ گیا۔ اب لوگ میری بات پر عمل کریں کہ نہیں یہ ان کی مرضی، مجھے جو کہنا تھا میں نے کہا۔

غزل(۲):

میرے آنگن سے کبھی ہو کے نہ گزرا سورج راستہ اپنا کسی دن تو بدلتا سورج

عابؔد مناوری کہتے ہیں کہ سورج کبھی بھی میرے صحن سے نہیں گزرتا ہے۔ کاش یہ سورج کبھی اپنا راستہ بدل کر بھول سے میرے صحن کی طرف آجاتا۔ سورج کے آنگن سے ہو کر گزرنے سے مراد مقدر کا بدلتا اور قسمت کا چمکنا ہے یعنی نہ میری قسمت چمکتی ہے اور نہ ہی مقدر بدلتا ہے اور نہ ہی مجھے کوئی خوشی نصیب ہوتی ہے۔

دن جو نکلا بھی تو چھائے رہے غم کے بادل دل کی نگری پہ کبھی کھل کے نہ چمکا سورج

شاعر کہتے ہیں کہ اگر کہیں دن نکلا بھی تو غم کے بادل پر بھی چھائے رہے یعنی اگر کبھی قسمت میں خوشی تھی تو اس کے ساتھ ہی غم آ ٹپکے۔ خوشیوں کے ساتھ ہمیشہ غم آتے رہیں۔

قہقہہ زن ہے میری ہار پہ دشمن میرا پردۂ شب سے پھر ایک بار نکل آ سورج

عابؔد مناوری کہتے ہیں کہ میری ہار پہ میرا دشمن بھی کھل کھلا ہنس رہا ہے۔ اے سورج!

ایک بار تو رات کے پردے سے باہر نکل آ تا کہ میرے آنگن میں بھی روشنی کا گزر ہو جائے اور میرا دشمن مجھ پر ہنسنے نہ پائے۔ میں محبت میں ہار گیا ہوں اور میرا دشمن مجھ پر زور زور سے ہستا ہے۔ کاش میرا محبوب سامنے آتا اور یہ رات کا اندھیرا یعنی میرے سارے غم اور دکھ ختم ہو جاتے اور میرے دل میں بھی روشنی اور خوشی آ جاتی۔

اک طرف رات کے شیدانہ و انجم کتنے اک طرف دن کا پرستارا اکیلا سورج

شاعر کہتے ہیں کہ ایک طرف رات پر مٹنے والے کتنے ستارے ہیں اور ایک چاند ہے۔ یعنی رات کے وقت ایک چاند اور بے شمار ستارے چمکتے رہتے ہیں اور ایک طرف دن ہے جس کا پرستش کرنے والا اکیلا سورج ہے۔ گویا صرف ایک سورج دن کے وقت چمکتا ہے اور روشنی اور گرمی دیتا ہے۔

غیر ممکن ہے شب غم کی سحر اے عابؔد کس نے مغرب سے نکلتے ہوئے دیکھا سورج

شاعر اپنے آپ سے مخاطب ہو کر کہتے ہیں اے عابؔد! غم کی اندھیری رات کا صبح ہونا ناممکن ہے۔ جس طرح سورک کا مغرب سے طلوع ہونا ناممکن ہے اسی طرح محبوب کی جدائی میں غم کی رات کا ختم ہونا بھی ناممکن ہے۔ اس غم کی رات کی صبح کبھی بھی نہیں ہوتی یعنی میرے دل میں کبھی بھی خوشیاں نہیں آئے گی۔

کتابی سوالات کے جوابات

جواب(ا)

شاعر عابؔد مناوری جب دل کے انرونِ نظر سے دیکھتا ہے تو وہ اپنے آپ کو خود سے نا آشنا پاتا ہے۔ گویا اس نے اپنے آپ کو اور اپنی حقیقت اور اصلیت کو نہیں پہچانا ہے۔

جواب(۲)

شاعر دستِ سوال لیکر اپنے محبوب کے دروازے پر جاتا ہے جہاں سے ہر کوئی خالی ہاتھ ہی لوٹتا ہے اور کسی کی بھی مراد جہاں پوری نہیں ہوتی۔

جواب(۳)

شاعر کو زندگی میں مصائب و آلام کے سوا کچھ حاصل نہ ہوا۔ راہِ مصیبت سے گزرنا ان کا معمول بن گیا۔ درد کے چھالے اس کے پختہ ہو گئے۔ بوجہ سادہ لوحی، طولِ درد میں شاعر کو لذت کا احساس ہوا۔ گو بسبب شاعر اپنی تباہیوں پر خوش ہو رہا ہے۔

جواب(۴)

مہ و انجم رات کے شیدائی ہیں۔ اس لئے کہ یہ رات کے وقت ہی چمکتے ہوئے نظر آتے ہیں۔

نظم "پری محل" از شہزور کاشمیری

پہلا بند:

یاد ہے وہ رادیٔ کشمیر ۔۔۔۔۔۔۔۔۔۔۔۔آفریں تھے بلبلوں کے چہچہے

شاعر شہؔ زور کاشمیری کہتے ہیں کہ مجھے وادیٔ کشمیر کا موسم بہار اب بھی یاد آتا ہے کیونکہ اس موسم میں کشمیر کی خوبصورتی میں زیادہ اضافہ ہوجاتا ہے۔ مجھے وہ نہروں کی روانی یاد آتی ہے۔کس طرح یہاں کی نہریں جھومتے جھومتے انسان کو دیوانہ کردیتی ہے۔موسم بہار کی تازگی اور بادلوں کی مستی اس طرح کشمیر کو سجانے میں مصروف ہوجاتی ہے جیسے کوئی نئی نویلی دلہن ہو۔ یہاں کے مسکراتے ہوئے پھول اور بلبلوں کے میٹھے گیت یہاں کی فضا کو اور زیادہ پُرنور بنادیتی ہے۔

دوسرا بند:

دامنِ کہسار تھا ۔۔۔۔۔۔۔۔۔۔۔۔پردۂ در تھا وہاں

یہاں دامنِ کوہسار زبرون پہاڑ کے دامن کو کہا ہے۔شاعر شہؔ زور کاشمیری کہتے ہیں کہ یہ دامنِ کوہسار اس قدر پُرنور ہے جیسے خدا نے اس پر اپنے نور کی بارش برسائی ہو۔اس کی خوبصورتی دیکھ کر ڈل کے کنول کے پھول بھی کھل اٹھتے ہیں۔اس خوبصورتی کے تصور نے مجھے اس قدر بے قرار کردیا کہ مجھ سے رہا نہ گیا اور میں پری محل چلا گیا جو زبرون پہاڑ کے دامن میں واقع ہے۔ پری محل کی خوبصورتی نے مجھے اس قدر مست کردیا کہ میں سارے غم بھول گیا۔لیکن میری آنکھوں اور محل کے درمیان ایک پردہ پڑا تھا جس کی وجہ سے میں اس حسین منظر سے محروم

تھا۔

تیسرا بند:

تین صدیوں قبل ۔۔۔۔۔۔۔۔۔۔۔۔ قصر ہے ایوان ہے

شاعر شہؔ روز کاشمیری کہتے ہیں کہ میرے شوقِ دیدار نے تین سو سال قبل کے پردے کو ڈرتے ڈرتے سرکا دیا۔ میری ہر طرف جو تاریکی پھیلی ہوئی تھی وہ روشنی میں بدل گئی۔ اس قدر سارا ماحول پُرنور ہو گیا جیسے روشنی پھیلانے والا سورج اپنے شباب پر آ گیا ہو۔ پری محل کی خوبصورتی نے مجھے اس قدر مست کر دیا کہ میں سارے غم بھول گیا۔ لیکن میری آنکھوں اور محل کے درمیان ایک پردہ پڑا تھا جس کی وجہ سے میں اس حسین منظر سے محروم تھا۔

چوتھا بند:

کوہِ سبزہ پوش پر ۔۔۔۔۔۔۔۔۔۔۔۔ رنگین جبین حسن پر

شہؔ زور کاشمیری کہتے ہیں کہ جونہی یہ درمیان کا پردہ ہٹ گیا تو پری محل اسقدر چمکتا ہوا نظر آیا جیسے سبز پہاڑی پر سونے کا محل چمکتا ہو۔ اور وہاں ہر طرف اسقدر روشنی پھیل گئی تھی جیسے ایک بار پھر سے کوہِ طور پر خدا نے اپنا جلوہ دکھایا ہو۔ پری محل کی خوبصورتی اسقدر عیاں تھی جیسے سبز جھاڑی پر کوئی رنگین تیتری بیٹھی ہوئی ہو یا جیسے زمرد کے پتھروں سے بھری ہوئی کوئی پری ناچتی ہو۔ پری محل اسقدر پُرنور تھا جیسے آسمان سے خود چاند اترا ہو اور اس حسین زمین کے ماتھے پر تلک بن کر چمک رہا ہو۔

پانچواں بند:

بادۂ تقدیس کے بادل ۔۔۔۔۔۔۔۔۔۔۔۔ دل کش خواب کی تعبیر ہے

شاعر کہتے ہیں کہ یہاں پاکیزہ شراب کے بادل برستے ہیں یعنی یہاں پاکیزگی برستی ہیں۔ یہاں حسین پھول کھلتے ہے اور بلبل اپنے میٹھے گیب گاتے ہیں۔ یہاں کی ہوا آہستہ آہستہ چلکر ہر طرف خوشبو پھیلاتی ہیں اور فرشتے جھوم جھوم کر خدا تعالیٰ کا کلمہ پڑھتے ہیں اور حمد وثنا کرتے ہیں۔ پری محل کسی شاعر کے ذہن کی تصویر ہے یا کسی حسین پری کے دلکش خواب کی تعبیر ہے۔

چھٹا بند:

شام ہے اس گل کدے کی ۔۔۔۔۔۔۔۔۔۔۔۔ ہاتھوں میں ہے جام رنگ و بو

شاعر شہؔ زور کاشمیری کہتے ہیں کہ اس چمن کی شام بھی اپنے حسن میں بے مثال اور لاجواب ہے۔ یہ باغِ جنت کا ایک حسین نکھرا ہوا گلاب ہے۔ یہاں کی صبح کی چمک دمک الگ ہی نظارہ پیش کرتی ہے۔ پری محل صبح کی روشنی میں اسقدر چمکتا ہے جیسے کوئی نئی نویلی جنت اپنی جوش جوانی پہ ہو۔ قدم قدم پہ قدرت نے اس کو سجایا ہے۔ یہاں کا ہر پودہ خوشبو بکھیرتا ہوا اور رنگین پیالے کی مانن نظر آتا ہے۔

کتابی سوالات کے جوابات

جواب(۱)

موسم بہار کی آمد سے کشمیر کی خوبصورتی میں زیادہ اضافہ ہوجاتا ہے۔ نہروں کی روانی دیکھ کر انسان دیوانہ ہوجاتا ہے۔ موسم بہار کی تازگی اور بادلوں کی مستی اسطرح کشمیر کو سجانے میں مصروف ہوجاتی ہے جیسے کوئی نئی نویلی دلہن ہو۔ یہاں کے مسکراتے ہوئے پھول اور بلبلوں کے میٹھے گیت یہاں کی فضا کو اور زیادہ پُرنور بنادیتی ہے۔ موسم بہار میں دامن کوہسار اس قدر نورانی ہوتا ہے جیسے خدا نے اس پر اپنے نور کی بارش برسائی ہو۔

جواب(۲)

موسم بہار میں کشمیر غنچۂ فردوس سے کچھ کم نہیں ہوتا۔ جس سمت بھی نظر جاتی ہے تو پھول مسکراتے ہوئے نظر آتے ہیں۔ اور جہاں بھی سانس لیتے ہے وہاں ان پھولوں کی کوشبو کا احساس دل کو معطر کر دیتا ہے۔ غرض بہار میں خطۂ کشمیر کو گلکدہ کہنا بجا ہوگا۔

جواب(۳)

وادیٔ کشمیر کو اپنی خوبصورتی کی وجہ سے دنیا میں جنت کا ٹکڑ سمجھا جاتا ہے۔ قدرت نے اس خطے کو خوبصورت بنانے میں کوئی کثر نہیں چھوڑی ہے۔ قدم قدم پر قدرت نے اس خطے کو دلہن کی طرح سجایا ہے۔ شاعر نے پری محل کو کشمیر کی شان قرار دیا ہے اور اس جگہ کے گوشے گوشے کو قدرت نے سجایا ہے یعنی اسی جگہ پر اہتمامِ رنگ و بو ہوتا ہے۔

جواب(۴)

مسدّس وہ صنفِ شعر یعنی وہ نظم ہے جس میں ہر بند کے چھ مصرعے ہوتے ہیں۔ پہلے چار مصرعے ہم قافیہ و ہم ردیف ہوتے ہیں اور بقیہ دو مصرعوں کا ردیف و قافیہ مختلف ہوتا ہے۔ مسدّس ہئیت کے اعتبار سے بیانیہ شاعری کے لئے موزوں تر طرزِ اظہار ہے

شہریارؔ

غزل اول کی تشریح:

زخموں کو رفو کرلیں دل شاد کریں پھر سے خوابوں کی کوئی دنیا آباد کریں پھر سے

شہریارؔ کہتے ہیں کہ ویران زندگی کی وجہ دل کی تکالیف اور اضطراب ہے۔شاعر خواہش ظاہر کرتے ہے کہ ان زخموں کو رفو کر کے یعنی زخموں کو بھر کے خوابوں کی دنیا بسائی جائے یعنی خوابوں کو حقیقت کا جامہ پہنایا جائے اور خوشحال زندگی کی شروعات کی جائے۔

مدت ہوئی جینے کا احساس نہیں ہوتا دل اس سے تقاضا کر بیدار کریں پھر سے

شہریارؔ کہتے ہیں کہ عرصہ دراز سے جینے کی چاہت باقی نہیں رہی۔وجہ محبوب کی ناراضگی اور ترکِ تعلق ہے۔جو ستم میرے محبوب نے مجھ پر ڈھائیں ہیں ان کی وجہ سے میں تڑپتا رہتا ہوں اور جینے کا احساس ہوتا رہتا ہے اسی لئے میں چاہتا ہوں کہ محبوب کو طلب کر کے ظلم وستم کی فریاد کروں تا کہ یہ سلسلہ ہمیشہ قائم رہے۔

مجرم کے کٹہرے میں پھر ہم کو کھڑا کردو ہو رسم کہن تازہ فریاد کریں پھر سے

شہریارؔ کہتے ہیں کہ مجھ کو مجرم کی طرح کٹہرے میں کھڑا کرو کیونکہ میں نے بھی جرم محبت کیا ہے۔جس طرح مجرم عدالت میں فریاد کرتا رہتا ہے اسی طرح میں بھی اپنے غموں کی داستان سنا کر اپنے محبوب سے انصاف کی فریاد کرتا۔اس طرح پرانی رسمیں تازہ ہو جاتی ہے۔

اے اہلِ جنوں دیکھو زنجیر ہوئے سائے ہم کیسے انہیں ،سوچو، آزاد کریں پھر سے

شہریارؔ اس شعر میں عشاق سے مخاطب ہو کر کہتے ہیں اے اہلِ جنوں! دیکھو تو سہی کہ غمِ عشق کی وجہ سے میری زندگی کو غموں نے زنجیروں کی طرح جکڑا ہے۔غموں کی زنجیریں سایے کی

طرح ہر وقت پریشان کرتے رہتے ہیں۔تم ہی کہدو کہ میں ان زنجیروں سے اپنے آپ کو کیسے آزاد کردوں۔

اب جی کی بہلنے کی ہے ایک یہی صورت بیتی ہوئی کچھ باتیں ہم یاد کریں پھر سے

شہریارؔ کہتے ہیں کہ محبت کے سرف میں، میں اس موڑ پر پہنچا ہوں کہ جہاں افسردگی کے علاوہ کچھ نظر ہی نہیں آتا اور جہاں دل اضطراب کا شکار ہو چکا ہے۔اب دل کے قرار کیلئے ایک ہی طریقہ نظر آنے لگا ہے کہ ماضی کی وہ حسین باتیں یاد کرلوں جو میرے اور میرے محبوب کے درمیان ہوا کرتی تھیں۔

میں ایک شہر تھا۔۔۔۔پونچھ

کتابی سوالات کے جوابات:

جواب(۱):

ناول انگریزی لفظ ہے۔اس کے معنی ''نئے'' کے ہیں۔ناول وہ نثری تحریر ہے جس میں ایسی کہانی بیان کی گئی ہو جو زندگی کی ترجمانی کرتی ہو۔ناول زندگی کے مسائل پر بحث کرتا ہے۔ ناول کا فن دراصل معاشرتی یا انفرادی زندگی کی ترجمانی اور تصویر کسی کا فن ہے۔اس کے کردار انسان ہی ہوتے ہیں۔ایک اچھے ناول میں زندگی کا نقشہ لازمی شے ہے۔ناول ایک خیال ہے جو لوگوں تک پیغام لیجانے کا بہترین ذریعہ ہے۔ناول کی بہت سی قسمیں ہیں جیسے روحانی، جاسوسی، سماجی، اقتصادی وغیرہ۔ پرانی ناولوں کا ۔مقصد صرف معاشرت کو ٹھیک کرنا تھا۔رفتہ رفتہ ناول ہر کسی موضوع پر لکھی جانے لگی۔

جواب(۲):

کرشن چندر کی ولادت ۲۳ نومبر ۱۹۱۳ء کو بھرت پور راجستھان میں ہوئی۔آپ کے والد کا نام ڈاکٹر گوری شنگر چوپڑا تھا۔جن کے چار بیٹے اور ایک بیٹی تھی۔گوری شنکر ملازمت کے سلسلے میں پونچھ آ گئے۔کرشن چندر نے آٹھویں جماعت تک اپنی تعلیم پونچھ میں ہی حاصل کی اور اعلیٰ تعلیم حاصل کرنے کیلئے لاہور روانہ ہونا پڑا۔

بچپن میں کرشن چندر کا رجحان نثر کے مقابلے میں شاعری کی جانت زیادہ تھا لیکن اپنے استاد دینا ناتھ رفیق کے مشورہ پر انہوں نے شاعری ترک کی اور نثر کی طرف متوجہ ہو گئے۔

۱۹۷۴ء میں کرشن چندر نے آخری بار اپنے اہل خانہ کے ساتھ پونچھ کا سفر کیا اور آ کر کار ۱۹۷۷ء میں ۶۴ برس کی عمر میں انتقال کر گئے۔

ناولوں میں آپ کا طرز تحریر عمدہ، صاف اور پُر اثر ہے۔ آپ کی ناولوں میں انفرادی زندگی کے جذبات اکثر و بیشتر نظر سے گزرتے ہیں۔ آپ اپنی ناولوں میں زمانۂ ماضی و حال کو مدِ نظر اور مد مقابل کر کے اپنے جذبات کی عکاسی مبالغہ انداز میں کرتے ہیں۔

جواب(۴):

کرشن چندر نے پونچھ کی ایک ایک شے اور ایک ایک جگہ کا مقابلہ دنیا کی دوسری اشیاء اور جگہوں سے کیا ہیں اور ہر بار انہیں پونچھ ہی خوبصورت نظر آیا ہے۔ اسی طرح انہوں نے پونچھ کو خوبصورت شہر روم کے مدِ مقابل رکھا اور کہا، خوبصورت روم سات ٹیلوں پر آباد ہے تو میرا پونچھ بارہ ٹیلوں پر۔۔۔۔ شاید اسی لئے مجھے روم سے خوبصورت معلوم ہوتا ہے۔

جواب(۵):

کرشن چندر کے والد صاحب طبیب تھے اور وہ شاہی محل راجہ کی بیماری کا علاج کرنے کی غرض سے گیا تھا اور اپنے بیٹے کو بھی ساتھ لے گیا تھا۔ کم سن کرشن شاہی محل میں ہم عمر لڑکوں کے ساتھ کھیلنے میں مصروف ہو گیا تو کھیل کھیل میں راج کمار نے اس کا وزیر آبادی چاقو چھین لیا جو لڑائی کا باعث بن گیا اور مار ماری میں کم سن کرشن ڈھیر ہو گیا اور اس کے کپڑے بھی پھٹ گئے۔

خاکہ: نذیر احمد کی کہانی کچھ میری اور کچھ ان کی زبانی

کتابی سوالات کے جوابات:

جواب(۳):

نذیر احمد کے ساتھ پڑھنے والوں میں درج ذیل ادیب شامل تھے۔

الف) سید احمد خان

ب) منشی ذکاءاللہ

ج) پیارے لال

جواب(۴):

نذیر احمد کے خیال میں آج کل علم پڑھاتے نہیں بلکہ شاگردوں پہ لادتے ہیں۔ جو آج پڑھا کل بھولے۔ آج کل متعدد مضامین پڑھاتے ہیں مگر کامل نہیں کرا دیتے ہے۔ نذیت احمد کے مطابق کسی ایک مضمون میں اختصاص حاصل کرنا ہی اصل تعلیم ہے۔

جواب(۷):

سبق ''نذیر احمد کی کہانی کچھ میری اور کچھ ان کی زبانی'' میں جو محاورے استعمال ہوئے ہیں وہ درج ذیل ہیں

الف) ہنسی کے مارے لوٹنا بمعنی بے حد ہنسنا

ب) ٹانگ لینا بمعنی پیچھے پڑنا

ج) گھاس کاٹنا بمعنی دلی سے کام کرنا

د) آنکھوں کے سامنے آنا بمعنی روبرو آنا

و) گٹے پڑنا بمعنی نشانات پڑنا۔

ہ) کاٹھ کا الو بمعنی بے وقوف

جواب(ا):

نذیر احمد کا رنگ سانولا تھا۔ چوڑان کی وجہ سے ٹھگنا معلوم ہونے لگا تھا۔ بدن بھنے ہوئے چاول کا تھیلا نظر آتا تھا۔ ٹھگنے پن کا تکملہ اونچی ترکی ٹوپی سے کرتے تھے۔ پیٹ اسقدر بڑا تھا کہ کمر بند باندھنے کی ضرورت ہی نہیں پڑتی تھی۔ سر بڑا اور بالوں کے بغیر تھا۔ آنکھیں چھوٹی اور ابرو گھنی اور آنکھوں کے اوپر سایہ فگن تھیں۔ دہانہ بڑا اور آواز میں گرج تھی۔

خطوط غالبؔ

کتابی سوالات کے جوابات

جواب(۱):

مرزا غالبؔ کی اردو خط و کتابت پرانی طرز کی خط و کتابت سے بالکل مختلف اور سب سے نرالی ہے۔ وہ اپنے خطوط میں کبھی میاں برخوردّار، کبھی بھائی، کبھی مہاراج کبھی اور مناسب لفظ سے شروع کرتے ہیں۔ اس کے بعد مطلب لکھنے لگتے ہیں۔ اور شروع سے ہی اپنا مدعا بیاں کرتے ہیں۔ اپنا مطلب تحریر کرنے کا طریقہ بالکل ایسا ہے جیسے دو آدمی آنے سامنے بات چیت یا سوال و جواب کرتے ہس۔ غالب معلمو لی باتوں کو اپنے اندازِ بیان سے اس قدر دلچسپ بنا دیتے تھے کہ آج بھی ان خطوط کو پڑھ کر ہم لطف اندوز ہوتے ہیں۔

جواب(۲):

ارے دوست! کیا بات ہے۔ اتنی خاموشی کیوں؟ یا تو مجھ سے کوئی خطا سرزد ہوئی ہے یا تم ہی کسی کام میں پھنسے ہوئے ہو جس کی وجہ سے تم خط کا جواب نہیں دے رہے ہوں۔ دو محبت نامے پہلے بھی لکھ چکا ہوں لیکن جواب سے محروم رہنا پڑا۔ بہت فکر ہو رہی ہے۔ تم کو میری پریشانی کیوں عزیز ہے؟ تمہارے خط کا انتظار بے صبری سے کر رہا ہوں۔ کبھی کبھی سوچتا ہوں کہ شاید تمہارے امتحانات قریب آ رہے ہیں۔ خیر جو کچھ بھی ہو خط میں لکھنا۔

محرّرہ شنبہ

۲۴ اگست ۲۰۱۹ء

سرتاج خان

خواب(۳):

مرزا غالب کو رام پور سے بے حد محبت تھی۔ غالب نے رام پور کو آرام کی جگہ بتایا ہے۔ یہاں کے آپ کو سی کو تعریفوں سے آراستہ کیا ہے۔ اور اس کی آب حیات سے نہ صرف مشابہت کی بلکہ اس کو آب حیات کو اسے بھی شیرین کہا ہے۔ غالبؔ نے یہاں کے لوگوں کو دوست نواز کہا ہے۔

درد کا مارا از پنکر ناتھ

جواب(۱):

صمد جو کے والد رمضان جو ایک بہترین اور مشہور ٹیکسی ڈرست تھا۔ یعنی وہ مردہ جانوروں کا گوشت اور ہڈیاں نکال کر کھال کو صاف اور خشک کر کے اس میں روئی بھرنے کا ہنر بخوبی جانتا تھا۔ رمضان جو نے اپنے بیٹے صمد جو کو اس ہنر کے تمام اسرار و رموز سکھائے تھے۔ یعنی صمد جو نے ٹیکسی ڈرمی کا ہنر اپنے والد رمضان جو سے سیکھا تھا۔

جواب(۲):

صمد جو نے اپنی فنکارانہ مہارت، انتھک محنت اور سادہ طبیعت کی وجہ سے ترقی کی منزلیں مختصر وقت میں طے کیں اور صاحب حیثیت تاجر بن گیا۔

جواب(۳):

لڑکی کا دکان کے سامنے سے بار ہا گزرنا اس بات کی عکاسی کرتا ہے کہ وہ چیتے کے بچے اور اس کی بناوٹ پر قریضتہ ہوگئی تھی۔ مطلوب شدہ جانور کی قیمت سنکر لڑکی کا چلے جانا اس بات کی عکاسی کرتا ہے کہ اس کے پاس موزوں رقم نہیں تھی۔ یہ کیفیت دیکھ کر صمد جو کو ہونٹوں کی اس خاموش تھرتھراہٹ کا احساس ہوا جب اس کا دل بھی ایسی چیزوں کو دیکھ کر فریضتہ ہوتا تھا۔ گو بسبب صمد جو نے چیتے کے بچے کی قیمت کم کر دی۔

جواب(۴):

مطلوب شدہ جانور کی کم قیمت سنکر لڑکی اپنی کم سنی کی وجہ سے قوتِ متفکرہ اور قوت آخذہ کھو بیٹھی اور اپنی تلخی کو ظاہر کرتے ہوئے کہا ''میں نے اپنے وطن میں سنا تھا کہ کشمیر میں سب فریبی ہیں۔ پہلے زیادہ قیمت بولتے ہیں اور پھر کم قیمت میں بیچتے ہے اور اس بات کی تصدیق آج ہوگئی۔

جواب(۵):

پرندے: مرغیاں ۔ راج ہنس ۔ رام چڑیا ۔ بطخ

جھیلیں: ہوکرسر ۔ ولر ۔ ڈل ۔ مانسبل

جانور: چیتا ۔ بارہ سنگھا ۔ مارخور